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Profit Protection In Contract Research Accounting

by L. PAUL BROCK

Assistant Treasurer, Electronics Research, Inc., Evansville, Ind.

This article, which includes case study background, reaches into the fields of research accounting and government contracts and offers both general considerations and procedural steps to facilitate contract administration and cost control. Special emphasis is given to the need for care in setting and following through on overhead rates used. Summary and ledger records are exhibited and described.

THE TREMENDOUSLY ACCELERATED PACE of our economy has had an effect on the field of research and development which can hardly be matched in any other area. This has made the field of research and development amazingly complex and highly specialized. Any comprehensive treatment of the accounting problems and procedures of research and development organizations would require volumes rather than a brief treatise such as this. As the field of research is of necessity specialized, so too, to a certain extent, must the accounting procedures of research organizations be specialized to meet particular needs.

A Hypothetical Research Organization and Its Contracts

For our present purpose, we will assume that we are considering some phases of the accounting practices and problems of a research organization in the field of electronics, working primarily under contracts with Department of Defense agencies of the United States Government. We will further assume that this firm employs in the neighborhood of one hundred and twenty-five people, approximately two-thirds of whom are technical employees—engineers or tech-

nicians considered as direct labor employees—and one-third of whom are executive and administrative, including office, maintenance, and security personnel.

It might be noted at this point that there is a very close relationship between the number of technical or direct labor employees and the volume of business which a laboratory of this nature is capable of handling, because the principal commodity which it has for sale is the services of its research personnel. For purposes of illustration, let us assume that the laboratory under consideration does an average annual volume of approximately one and one-quarter million dollars. The fiscal year is assumed to end September 30.

We are assuming also that this laboratory is working under more than one type of contract. Perhaps, for this reason, it would be profitable at this point to deal briefly with the different types of contracts involved. The most popular type of research and development contract is some form of cost reimbursement contract. The reason for this becomes readily apparent when we realize that the research groups deal largely with unknowns.

Stated in simple terms, a research and development cost-reimbursement contract usually comes into existence in a specific way. In response to an invitation to bid on a specific research project, a laboratory submits the best possible estimate of anticipated costs for the work, together with a proposed method of performance. The government agency desiring to contract for the work will examine all proposals submitted, giving consideration to proposed price, method of performance, facilities, qualifications of personnel, and any other factors which might have a bearing on satisfactory performance. When it has been determined which proposal appears to be most advantageous for the government, the contracting officer or the agency of the government will begin negotiations with the firm which submitted that proposal, with a view to entering into a firm contract. During negotiations the proposed amount of the contract may be revised but, when an agreement has been reached between the government and the contractor, a definitive contract will be issued, in which the contract amount is clearly stated.

The cost-plus-fixed-fee contract is probably one of the most widely used research and development contracts. It provides for the reimbursement to the contractor of allowable costs. The amount of the fee is also expressly mentioned in the contract. In the case of non-profit research groups, the fee may simply be a stated consideration of one dollar. The contract setting a fixed price with price redetermination clause is also a familiar type of contract for research and development work. The fixed price contract provides for the payment of a firm, stated price. It is rather rare as a prime research and development contract. The time and material contract provides for the reimburse-

ment of contractor's costs on the basis of hours of direct labor worked and cost of direct material and other allowable direct charges.

The Problem is With the Overhead Rate

Throughout this discussion there will be numerous references to allowable cost. It is at this point that many contractors experience difficulty because their conception of allowable costs is not the same as that which is defined in their contracts. Most contractors have comparatively little difficulty in allocating specific direct costs to the proper contracts. The major difficulty usually seems to arise in connection with indirect costs, particularly items of overhead, which are considered as an inescapable and accepted part of normal business operation, e.g., interest, contribution, entertainment, advertising except help wanted ads and trade journal advertising, and certain types of travel expense. While these expenses are a normal part of most business operations, the fact remains that they are expressly excluded from allowable cost on government contracts.

Since a considerable portion of the discussion to be presented will center around information contained in the Periodical and Accumulative Synopsis (Exhibit 1), attention is invited to that document at this point. Among smaller companies, however, the synopsis sheet is not so widely used. This is true probably because management and accounting personnel are usually located within hailing distance of each other and the type of information which would be incorporated in a synopsis is generally made available to management by the accounting staff in a number of detailed reports. The relationship between the two departments is close, comparatively informal, and the nature of operating reports required may be subject to frequent revision. Not only that but the government contractor soon learns, if he did not know in the beginning, that his accounting records are subject to examination and review by successive echelons of government cost inspectors, property accounting officers, contracting officers, and General Accounting Office auditors. The synopsis shown here was originated by the author and has been used for the past five years by a research organization somewhat similar to our hypothetical example. Even though this particular form is designed for use by a research organization in electronics, some adaptation of it might be helpful for other firms.

One thing which may appear rather strange upon first examination of Exhibit 1 is the relatively large amount of space which is devoted to the treatment of itemized overhead. An examination of the method of overhead reimbursement may justify this seeming disproportion. In the case of overhead, reimbursement, if it is to be on anything like a current basis, must be made pro-

PERIODICAL AND ACCUMULATIVE SYNOPSIS

DATE: August 31, 1933

STATEMENT OF OVERHEAD

ACCOUNT	THIS YEAR — CURRENT PERIOD AMOUNT	% Of Direct Labor	% Of Total Overhead	THIS YEAR — ACCUMULATIVE AMOUNT	% Of Direct Labor	% Of Total Overhead
Salaries and Wages - Indirect	5,264 30	12 56	15 52	50,870 10	13 13	15 66
Depreciation - Automotive Equipment	131 82	32	39	979 80	25	30
Depreciation - Shop Equipment	324 78	78	96	3,402 52	88	1 05
Depreciation - Laboratory Equipment	1,184 79	2 85	3 50	10,616 16	2 50	3 27
Amortization - Leasehold Improvements	166 66	40	50	1,500 00	39	47
Freight and Express	58 92	14	18	1,345 42	35	41
Heat, Light, Power and Water	636 69	1 55	1 92	6,154 52	1 59	1 89
Salaries - Executive	4,300 00	10 34	12 77	47,300 00	11 32	13 50
Salaries - Administrative	8,811 16	21 23	26 17	80,335 00	20 72	24 68
Depreciation - Furniture and Fixtures	168 66	40	50	1,545 38	39	47
Depreciation - Office Equipment	152 96	37	46	1,401 38	36	43
Advertising - Non-allowable C.P.F.F. *				290 00	07	09
Advertising - Allowable C.P.F.F.				893 10	23	28
Engineering Scholarship *						
Interest *	127 78	31	38	1,051 28	27	32
Legal and Audit				450 00	12	14
Overtime Premium - Administrative	497 22	1 20	1 48	7,971 54	2 06	2 45
Vacations - Administrative Payroll	736 65	1 77	2 20	7,486 38	1 93	2 30
Sick Leave - Administrative Payroll	87 92	21	26	1,350 26	35	42
Employees' Welfare				258 96	07	08
Employees' Group Insurance	306 40	74	92	3,228 80	83	99
Postage	112 00	27	33	1,081 46	28	33
Stationery and Office Supplies	266 82	65	80	2,686 80	69	83
Maintenance and Repairs - Office Equip.	61 44	15	18	447 32	11	13
Entertainment *	20 00	05	06	771 70	20	24
Bank Service Charge				389 50	10	12
Contributions *	350 00	84	1 03	1,665 00	43	51
Memberships, Dues and Subscriptions	4 00	01	02	990 00	25	30
TOTAL OVERHEAD FOR PERIOD	33,137 16	79 83	100 00	350,806 50	83 77	109 09
Plus: Opening Inventory	34,209 40	82 42	101 40	28,338 54	6 73	8 77
Less: Closing Inventory	(33,284 20)	(81 84)	(98 66)	(33,284 20)	(8 19)	(10 34)
Plus: Other Charges to Cost of Overhead				1,678 38	40	52
AMOUNT INTO COST	34,397 36	82 87	102 00	326,881 22	81 00	101 67
Total Non-allowable Overhead C.P.F.F. *	1,089 10	2 64	3 23	9,862 26	2 36	3 06
Direct Labor	41,508 50	100 00	118 77	417,716 52	100 00	129 93

OPERATIONAL ANALYSIS

Project No.	Income - Current Period	Cost - Current Period	Results - Current Period	Income - Year To Date	Cost - Year To Date	Results - Year To Date
A-100	5,652.78	5,878.46	(225.68)	57,589.18	60,665.84	(3,076.66)
A-200				8,567.56	6,249.46	2,318.10
A-300	4,434.56	4,357.52	(80.76)	45,333.74	42,993.00	2,340.74
A-400	2,843.82	2,843.82	0.00	2,843.82	2,843.82	0.00
A-500				361,179.88	360,380.72	816.32
A-600	17,136.78	16,662.26	474.52	187,688.32	181,466.98	6,221.34
A-700	12,000.00	12,000.00	0.00	120,000.00	120,000.00	0.00
A-800				108,872.88	95,893.78	12,979.10
A-900	32,000.00	30,525.76	1,474.24	32,000.00	30,129.34	1,870.66
A-1000	1,000.00	1,000.00	0.00	10,000.00	10,000.00	0.00
A-1100	11,000.00	11,000.00	0.00	110,000.00	110,000.00	0.00
A-1200				1,678.38	1,678.38	0.00

COMPARATIVE BALANCE SHEET

ACCOUNT	CURRENT PERIOD This Year	CURRENT PERIOD Last Year	Increase (Decrease)
ASSETS:			
Cash	11,000 00	4,618 54	6,381 46
Accounts Receivable - Government	150,000 00	181,482 54	31,482 54
Cash Value - Life Insurance	6,000 00	5,191 00	809 00
	This Year	Last Year	
Furniture and Fixtures	17,500 00	16,917 38	
Less: Depreciation	9,497 66	7,498 80	10,498 58 / 10,998 34 / 499 76
Office Equipment	15,000 00	15,416 52	
Less: Depreciation	7,191 80	5,600 40	8,991 64 / 9,816 12 / 1,124 48
Automotive Equipment	6,901 96	6,901 96	
Traveling Advances	1,197 68	1,401 00	203 32
Deposits on Returnable Containers	1,000 00	1,000 00	20 00
TOTAL ASSETS	377,901 02	377,668 76	3,667 74
LIABILITIES:			
Accounts Payable	12,568 48	10,138 96	2,429 52
Notes Payable	14,000 00	97,300 00	83,300 00
Accrued Gross Income Tax	2,098 50	2,815 80	716 70
Surplus	350,254 04	351,213 96	48,959 04
TOTAL LIABILITIES AND CAPITAL	377,901 02	377,668 76	3,667 74

SUMMARY OF PROFIT AND LOSS

	THIS YEAR Cur. Period	THIS YEAR Accumul.	LAST YEAR Cur. Period	LAST YEAR Accumul.
C.P.F.F. Contracts	1,577 90	10,885 38	1,775 76	9,128 41
Non-C.P.F.F. Projects	18,602 30	79,172 84	1,708 76	56,231 61
TOTAL PROFIT OR LOSS	20,819 40	90,055 34	3,484 52	65,356 02

ANALYSIS OF SURPLUS ACCOUNT

ITEM	This Year	Last Year
Surplus at Beginning of Fiscal Year	350,954 82	321,487 36
Charges to Surplus Account:		
Results for Year to Date	99,055 34	65,356 02
PRESENT SURPLUS ACCOUNT	200,073 84	351,213 96

CONDENSED STATEMENT OF PROFIT AND LOSS

ITEM	THIS YEAR Cur. Period	THIS YEAR Accumul.	LAST YEAR Cur. Period	LAST YEAR Accumul.
INCOME				
C.P.F.F. Income	53,013 72	422,390 72	340,072 84	600,771 84
Non-C.P.F.F. Income	69,053 82	669,182 38	61,225 72	868,141 26
TOTAL INCOME	122,067 54	1,091,573 10	201,297 86	1,468,913 22
COSTS				
Cost of Material	10,728 82	135,598 86	17,751 56	136,406 86
Cost of Outside Work	1,308 84	65,156 00	1,428 10	62,580 74
Cost of Miscellaneous Direct Items	5,810 82	82,578 86	10,385 78	55,203 58
Cost of Direct Labor	65,460 72	630,303 86	92,096 96	622,806 38
Cost of Overhead	34,397 36	326,881 22	76,479 96	366,986 62
TOTAL COSTS	121,286 36	1,001,517 72	200,137 22	1,003,557 38
NET RESULTS	20,819 40	90,055 34	1,160 64	65,356 02
TOTAL COSTS AND RESULTS	122,067 54	1,091,573 10	201,297 86	1,068,913 22

CERTIFIED CORRECT BY: _____

visionally through the use of an overhead rate. The method used by our imaginary research laboratory is to determine the percentage which total overhead dollars bears to total direct labor dollars and to use that percentage for apportioning overhead to the projects. This is also the method by which our contractor is reimbursed by the government for his overhead costs under government contracts, the only difference being that reimbursement is on the basis of the ratio of total *allowable* overhead to total direct labor.

Of course, it is not practicable for an actual overhead rate to be determined for each pay roll period or even for each month. The usual practice is to make an overhead audit and to determine an overhead rate on a quarterly or semi-annual basis. When an overhead rate is determined, it is for the period preceding the audit and extending back to the date of the latest previous audit. When the actual rate for the audit period is determined, it is applied to the direct labor on the various contracts for the same audit period and an adjustment is processed on the contractor's next billing.

Money Can Be Lost If Nonallowable Overhead Is High

For purposes of illustration, let us take an extreme example and assume that the latest overhead audit of our research organization's records was as of August 31, 1952, and that it covered the period from October 1, 1951 through August 31, 1952. (In actual practice the audits would occur more frequently.) Since the synopsis sheet in our example is as of August 31, 1953, let us refer to the column under statement of overhead, in which is listed last year's accumulative amount. Dropping down near the bottom of the column to the line entitled "total overhead for period," we find the amount $326,402, which represents the total overhead for the period from October 1, 1951 through August 31, 1952. On the bottom line of the column we find that the total direct labor for the same period amounted to $397,153. However, if we divide the total direct labor into the total overhead for the period, we arrive at an overhead rate of 82.19 per cent.

On the line immediately above direct labor, we find an amount of $12,825, which represents the total amount of nonallowable overhead for the period under consideration. This amount is the total of the overhead accounts identified with an asterisk (*). These are the items which the government cost inspector will eliminate from total overhead before he computes the allowable overhead rate. For the purposes of our example, we will assume that the cost inspector's audit confirmed the contractor's record of total overhead and total nonallowable overhead. We find that the nonallowable overhead is 3.23 per cent of total

direct labor. Subtracting this from 82.19 per cent gives us an allowable overhead rate of 78.96 per cent. This is the rate which would have been used in adjusting billings for overhead reimbursement made for the period prior to August 31, 1953. Also it would have been used as a provisional rate for billings made subsequent to that date.

In order to examine the results of this billing at provisional rate, let us turn our attention to the column showing this year's accumulative overhead. Following the same procedure as before, we discover that the total overhead rate is 83.47 per cent, and that, of this rate, 2.36 per cent is nonallowable, leaving an allowable overhead rate of 81.11 per cent. We can readily see that for every $100 of direct labor which has been billed on cost-plus-fixed-fee contracts since the latest overhead audit and against which a provisional overhead rate of 78.96 per cent has been applied, the contractor is entitled to collect an additionad $2.15 in overhead adjustment when the next audit is made. Using the total direct labor figure of $417,618 for the year to date and assuming that approximately 60 per cent of that has been expanded on cost-plus-fixed-fee contracts, as would seem to be indicated by the condensed statement of profit and loss in the lower right corner of the synopsis, we will find that this particular contractor would have in excess of $5,000 coming to him as an adjustment on overhead reimbursement. All things being equal, this is a valid asset and should be reflected as such on the balance sheet. Had the rate gone down instead of up, it would have resulted in a liability instead of an asset and should be shown as such.

It will be seen that the trend of the overhead rate is of concern, not only to management, but to government cost people, who receive a copy of the synopsis each month, if the rate fluctuates considerably, which is often the case with small research organizations. The trend of the overhead rate is also important in the preparation of proposals for new business.

Before leaving our consideration of the statement of overhead, let us examine a little more closely the effect of nonallowable overhead on a contractor's operations. Again, let us refer to last year's figures on the synopsis sheet and do some imagining. From the condensed statement of profit and loss, we see that last year's total income to date was $1,048,913, of which $600,771 was from cost-plus-fixed-fee contracts. For the imagining part, let us assume for easy figuring that all this contractor's contracts of this type provide for a fixed fee amounting to five per cent of total estimated cost and that there is no holdback of any portion of the fee but that it is paid in proportion as the billing for costs is made. On that basis the $660,771 represents 105 per cent of the amount which the contractor has received for reimbursement of costs. By dividing, we

find that the reimbursement of costs amounts to $572,163, leaving a theoretical profit of $28,608 on these contracts.

However, the amount of $572,163 does not represent the contractor's total cost, because it includes the reimbursement of allowable overhead only and excludes the nonallowable items. Since these nonallowable overhead items total $12,825 and the proportionate share of this amount for cost-plus-fixed-fee contracts is approximately 60 per cent, we would have to consider that the contractor's actual cost is at least $7,500 more than his reimbursed cost. Of course, the only place for this to come is out of profit, so the actual profit is in the neighborhood of $20,000, which is approximately three and one-third per cent of cost instead of 5 per cent.

There seems to be a widespread belief that it is impossible to lose money on a cost-plus-fixed-fee contract. Such is not the case. If a contractor has nonallowable costs apportioned to a contract in sufficient quantity to exceed the amount of fixed fee provided by the contract, he not only can but will lose money on it.

How to Keep the Money Flowing Back

There are other costly pitfalls into which government contractors may stumble at times. One of these is to allow something to happen which will delay prompt reimbursement of costs. There are a number of things which might contribute to this condition. For one thing, failure to work closely with the contracting officer may result in misunderstanding on the part or one or both parties to a contract. Failure to read the contract closely enough to become familiar with its provisions is a major cause of delays or reimbursement of costs. Failure to insist on written formalization of any and all changes in the provisions of a contract is another. Any delay in reimbursement of contract costs is expensive to the contractor.

Failure to negotiate carefully on contract provisions may prove costly. Government contract negotiators are naturally going to try to obtain a contract as advantageous to the government as possible. Although they will not insist on provisions which will cause the contractor to lose money, they may propose provisions to which they fully expect the contractor to object, in order to obtain some concessions. The time to raise objections is while negotiations are in progress, not after a contract has been executed.

Another frequent cause of delay in reimbursement of costs is failure to obtain prompt approval of contractor's purchase orders for direct material. Most research contracts provide that orders for direct material have to be approved by

COST LEDGER Project No. N-1530

Date 1953	Particulars	Fol.	Material	Outside Wk.	Miscel.	Labor	Overhead	Total
	Brt. Fwd.	G	1,878.06	1,240.88	7.16	3,202.70		
7 28	A Company - Sheet Aluminum	V53 G	38.04					
28	B Company - Freight	V53 H			12.58			
31	Material from Stores	J6 G	110.24					
31	Indiana Gross Income Tax	J7 G			171.62			
31	Overhead @ 79.3587%						5,943.80	17,506.68
31	Less: Cost of Work Billed		(2,026.34)	(1,240.88)	(580.60)	(7,489.80)	(5,943.80)	(17,281.52)
8 1	Balance		16.14	14.34	12.58	--	--	43.06

EXHIBIT 2

the contracting officers or his designated representative having administrative cognizance of the contract. This approval is almost always readily obtainable when the purchase orders are submitted in proper form and the purchase is justified by an adequate explanation of the need for the material.

Another thing which may delay reimbursement of costs is a lapsed appropriation. This is something over which the contractor may not have much control, but it sometimes presents a very real problem. For example, appropriations bearing a fiscal 1952 date lapse as of July 1, 1954 and revert to the office of the comptroller general for final disposition. Later claims will be processed as claims against a lapsed appropriation and forwarded to the claims division of the general accounting office with appropriate recommendations for disposition. Payment of contractor's billings processed as claims usually takes considerable time.

Project Classification and Ledger Record

It is usually advisable for the accounting department to assume some direct responsibility in the assignment of internal identification numbers for research projects. First of all, it is well to keep in mind that the end-product of the research laboratory is usually a series of technical reports with a final report summarizing and presenting conclusions. Those reports will usually be tied in with the project identification number in some way. If a laboratory is to work under contracts with a number of different agencies of the government, it is well to make some part of the project number a symbol which will readily identify that agency to anyone in the laboratory. Simply using a letter or combination of letters as a prefix or suffix is one way of doing this, (e.g., NA for Navy Department, Bureau of Aeronautics). On the other hand, it is well to keep in mind, when devising a project numbering system, that, once a number has been assigned, it will have to be written many, many times by laboratory

personnel—on purchase requisitions, purchase orders, material received reports, shipping orders, pay roll records, technical reports, etc.

Most of the projects will probably be for research work to be done by the laboratory for an outside firm or agency. However, it is sometimes necessary or advisable to embark on internal projects. In a research group of any size, someone will almost invariably come up with an idea which is not included within the scope of any contracts which the laboratory has but which appears worthy of further investigation. Also, in the performance of laboratory tests, it sometimes happens that the need arises for a special type of equipment which is not available on the market. It then becomes necessary for the laboratory to design and build its own test equipment. If this is to be delivered to the contracting agency as a part of the performance of the contract or if it is of such a highly specialized nature that it cannot be used on any future work in the laboratory, then the costs incurred in constructing it should be treated as allowable costs under the contract. If it is anticipated, however, that the equipment will have a useful life beyond completion of the contract and if it is desired to retain the equipment for use on other projects in the laboratory, then a special project should be established against which the costs can be accumulated.

The contract cost ledger may take a number of different forms, depending on the need it must supply. Exhibit 2 shows the use of a simple six-column form which has proven to be very satisfactory in research accounting of the kind considered here. The information has been somewhat condensed. The exhibit shows the postings of various elements of cost for Project No. N-1500 (which also appears in the lower left-hand corner of Exhibit 1). Each project has a sheet or sheets in the cost ledger to which the elements of cost are posted from various books of original entry. Direct cost items of material, outside work, and most of the miscellaneous items such as freight and travel expense are posted individually as they occur during the month. Direct labor and overtime premium are posted as totals from a column on the pay roll summary sheet for the entire pay roll period, the entry coming via the cash disbursement journal. Material requisitions are listed on summary sheets for a month at a time and the charges to a project posted as a total at the end of the month. Gross income tax is computed as a percentage of the total of billed direct labor and overhead and is, therefore, charged in one amount by journal entry. The last entry of costs in each month is the one to charge each project with its proportionate share of the total overhead on the basis of direct labor expended. When this entry has been made, the cost ledger reflects the laboratory's total costs for the month as apportioned to projects.

The next step is to charge out the costs for work which has been billed.

ANNUAL PROJECT HISTORY RECORD—FISCAL YEAR ENDING SEPTEMBER 30, 1953

(In practice, Contract Identification Data is Supplied Here)

SUMMARY OF INCOME AND COSTS BY MONTHS

Month	Income	Costs										Profit Or Loss
		Direct Mat'l.	Outside Work.	Miscellaneous					Direct Labor	Over-head.	Total Costs	
				Freight	Travel	OT Prem.	Int. Gross.	Commun-ic'n.	Patent Exp.			
October												
July												
August	2,843.02					83.90	33.84			1,517.72	1,206.14	2,841.20	1.82
September												
TOT. FOR YEAR												
BRT. FWD.												
TOT. TO DATE												

EXHIBIT 3

The letters shown at the extreme left of the material column of the cost ledger indicate the month in which an item of cost was billed for reimbursement. This is a simple alphabetical procedure (with the letter "A" indicating January, etc.). This system not only simplifies the costing-out entry at the end of each month, but it helps to prevent the failure to bill any item of allowable cost through oversight. Detail has been omitted on Exhibit 2, but all of the items of cost for the month of July were included in the July billing except the amounts on Lines 3, 4, and 6, keyed by the letter "G" for July.

These three items were not eligible for reimbursement, probably because approved copies of the purchase orders had not been returned from the contracting officer. Consequently, they were not billed and not costed out, and we find them showing up as balances in their respective columns at the end of the month. During the month of August, however, these three items were approved and they were included in August billings. The totals of all balances after costing-out for all projects in the cost ledger must agree with the two control accounts shown in the asset section of the balance sheet in Exhibit 1 as work-in-process—direct charge and work-in-process—overhead.

Possibility of Faster Write-Off of Some Equipment

Much of the capital equipment of the research laboratory is standardized. However, probably the largest single investment in capital equipment which the laboratory makes is in test equipment of a more or less specialized nature. Many of the items do not fit easily into the more generally recognized classifications of capital equipment. Much of this type of laboratory equipment is of a fragile or delicate nature. Moreover, there is the element of obsolesence which has perhaps an even greater bearing. It seems wise for the management and accounting departments of research organizations to take a long look at

their depreciation schedules. It may be that they can and should justify and obtain approval for accelerated depreciation rates on laboratory equipment, in order that accounting records will reflect a more accurate picture of capital position of a company.

Expediting Accumulation of Data for Renegotiation

One matter which is of general concern to those who do work under government contracts, either as a prime or subcontractor, is renegotiation. If this job is left to be done entirely after the close of the fiscal year, it may throw a pretty heavy burden on the accounting department at an inconvenient time. In order to provide for an equalization of the work load, we have devised a Project History Record (Exhibit 3) for the accounting department of the small research organization.

One of these forms is prepared for each project which is active during the fiscal year. The lower portion of the project history record is largely a summarization of the information which comes from the cost ledger, with a breakdown of the miscellaneous direct cost items and the addition of columns for income and net results by months. It has the added feature of carrying data forward from one fiscal year to the next in the case of projects which extend into two or more fiscal years. The upper section of the form gives a ready reference to pertinent facts regarding the project, including an indication as to whether or not it is subject to renegotiation. It should be noted that Exhibit 3 shows the information for Project A-500, which is one listed on the fourth line of the operational analysis at the bottom of the synopsis.

The Research Spirit Should Carry Over to Accounting, Too

By way of conclusion to this presentation, it is helpful to realize that the field of accounting is, itself, one which can profit greatly from the pioneering spirit present in the area of research and development. We are too often prone to approach our job with resignation to a prosaic, rather humdrum sort of routine. To do so is unfortunate, for it restricts us to mediocrity. It may be true that the aims and purposes of accounting are pretty well fixed. It is not true that the best methods of accomplishing those aims and purposes have been perfected. The discovery of new methods, a conception of accountant's fullest service, the devising of better accounting forms to serve as vehicles for our most effective information—all these things await those of us who can recognize and utilize the opportunity which is ours.

A "Contribution" Approach to Distributing Costing

by FRANK S. HOWELL

Assistant Director, Renegotiating Division, Washington Renegotiation Board, Washington, D. C.

Emphasizing that distribution cost accounting has not developed at the pace of production cost accounting and suggesting that this may have more to do with the intrinsic character of the distribution problem than with the recent-to-current prolonged sellers' market, the author of this paper notes the heavy impact of the joint cost problem in distribution costs and offers a solution which will by-pass non-pertinent or impracticable allocations and still make for better control.

DIFFERENCES BETWEEN PRODUCTION and distribution accounting are many but, to the casual observer, none is more striking than the difference in their growth cycles. Over the years, production accounting has forged steadily ahead, moving from a mere classified recording employed by a relatively few manufacturers to the almost universally accepted control medium which it is today. Distribution accounting, on the other hand, a lusty infant some twenty-odd years ago, has since suffered a severe case of arrested development, despite a good deal of forced professional feeding on the part of teachers and economists. It is the practice to assume that many years of easy selling have brought about this unhappy situation, but this is by no means the sole answer. There are at least three other discernible reasons for the difference in the growth cycles of factory and distribution accounting.

The first is that factory accounting, measuring as it does the results of repetitive mechanistic processes, is essentially quantitative in character, and the end product of such accounting is subject to ready interpretation by those possessing knowledge of the manufacturing methods involved. Distribution accounting on the other hand, seeks to measure the results of qualitative processes, and, in the final analysis, can do little more than summarize in dollars the outcome of the interplay of countless human factors. For example, it is a relatively easy matter for the accounts to reflect the results of adding an extra shift in Department "X" or to provide information which permits forecasting such results with reasondable accuracy, but no accounting system ever to be devised can show that Salesman Joe would get much more business from Customer John if only he would time his regular visits two hours earlier.

As a second point, production-minded executives have long regarded manu-

facturing inefficiency as inexcusable and have been quick to appreciate the advantages provided by modern industrial accounting in locating areas in which improvement is needed. But a situation which, from a conventional accounting standpoint, appears to be one of inefficiency may, in distribution, actually represent something very different. Rare, indeed, in normal times, is the manufacturer who does not carry unprofitable items to round out a line, who does not sell in an unprofitable territory in the hope of eventually attaining a profitable degree of market penetration, or who does not aggressively push unprofitable new items with an eye towards the future. The already muddied accounting waters springing from such situations have all too frequently been further agitated by sales and accounting personnel who have never learned to appreciate the difference between profitability and efficiency as reflected in the accounts.

In the third place, once capital has been invested in equipment, the factory becomes burdened with a degree of inertia, and production flows through more or less stable channels from one month to another. So also it is with accounting for the costs of production. The resulting reports reflect operating conditions which only in times of emergency are subject to drastic change. Hence, their form may readily be shaped to recurrent management needs. But fixed investment is seldom a major factor in shaping the channels of distribution. However rigid such channels may appear to have become as a result of long-continued policies, they are actually quite flexible and very often are modified without the slightest disturbance to other phases of the business. While such flexibility is obviously desirable, it is hardly conducive to the success of the recurrent reporting process through which factory accounting is aided in reaching its maximum usefulness.

Practice — and a Basic Weakness

Conventional accounting as currently practiced does not provide management with reports which will automatically bring out the areas where corrective action is required in respect of distribution policies, procedures, and personnel. To bridge the gap between the information on distribution costs which current accounting does provide and the additional information, which is sorely needed, progressive management has been forced to resort to analytical techniques by means of which its reports are broken down into their component elements, which are then re-assembled in different form to provide the needed data. Frequently, it is necessary that management suspect that something is wrong before its analysts take charge of the problem. So widespread had this practice become among those who are distribution cost conscious that there is an increas-

ing tendency to regard these measures as the only possible way of handling the problem. Other companies take a less analytical approach and consider that they are controlling their distribution costs when they make comparisons with industry averages by means of common-size ratios or compare prevailing ratios in their own companies with those of prior years. These measures have gained widespread approval despite their unreliability.

Underlying the situation is a fundamental weakness in present-day distribution cost accounting which has yet to be resolved. This is the problem of joint cost allocation. A similar difficulty in factory accounting has been attacked in various ways. For example, the area of joint costs may have been so reduced through specialized manufacturing operations that it becomes of minor significance when matched against production costs which can be directly charged. Again, the incidence of cost may have been the subject of detailed engineering studies undertaken in developing standards, which leave little room for left-over allocation. The somewhat dubious concept of a magnetic time-functioning attraction between cost center and diversified production passing through that center has proven satisfactory enough in countless instances, and even the direct labor dollars and direct labor hours methods of allocation, generally so beloved, succeed in apportioning joint production costs in a manner which is pleasing enough if not taken too seriously.

But, in the selling aspects of multi-product distribtuion, there frequently may be only one direct product cost—the commission paid on the sale. All other costs must be allocated in some arbitrary manner, if allocated at all, and the joint costs far outweigh the direct.

The problem of distribution costing is complicated even for single-product companies. Obviously that product must be sold at a profit or the manufacturer's capital soon will be exhausted, but it is not necessary for every sale of the product to bring in a profit from every customer. It is sufficient for continued business existence that the net result of all transactions be profitable. Management, without too much criticism, may profess itself satisfied as long as a reasonable average profit is recorded each year. However, to be truly efficient management must look to more than this. It must seek constantly to maximize the gain from each transaction. Unless the accounting records are so maintained as to be informative in this respect, they fail by far to attain their greatest potential value.

For the multi-product company, the problem is intensified in all directions, and a new factor is added. This is the factor of time. At any given moment, there will be a bewildering array of joint distribution costs which can be prorated easily enough on some studied basis if sufficient attention is accorded.

But the relationship of the various products will constantly be changing. As of today, one may be in strong demand at a satisfactory price, while another may be a new arrival offered to customers at a price hardly sufficient to recover the cost of production. By tomorrow, consumers may have turned away from Product No. 1, and Product No. 2 may be selling in such volume that its production costs have been drastically reduced. Shifts of this kind will become even more frequent as selling competition intensifies. The accountant who clings to routinized allocations in the face of changing conditions will soon find that his figures are of little value to management.

The only valid reason for incurring joint costs at all, of course, is that it is more efficient to do business in this fashion. Hence it is fundamental to multi-product distribution that, if one of a group of joint products is dropped as unprofitable, many of the joint costs towards which its sale has contributed will not be eliminated but will simply have to be assumed by the remaining products offered for sale. Once this is understood, it becomes obvious that even the most satisfactory method of conventional distribution cost allocation cannot meet the needs of management in maximizing the efficiency of distribution.

In summary, management urgently needs a method of understandable and timely reporting on distribution activities. To be of maximum usefulness, such reporting must clearly distinguish between expenses directly attributable to the activity under report and expenses incurred jointly in connection with other related activities. There should also be a further distinction between the cost of functions which must continue as long as the business itself continues and the cost of functions which are terminable at the option of management.

A Possible Solution — Theory

Conventional accounting contemplates that a profit figure appear in the statements at various levels of operation. Yet there is no reason why this concept should be regarded as sacrosanct in preparing reports intended to aid management in maximizing distribution efficiency. If profit figures are to be the end result of distribution accounting, allocation of all costs is necessary, but why should they be the end result? In multi-division production reporting, allocation of executive office expense to operating divisions is frequently considered unnecessary and the profits or losses of each division are treated as contributions to a common pool, from which the total of executive office expenses is deducted to arrive at company operating profit. It appears equally practical to prepare reports on the cost of distribution in the same fashion, with contributions to a common pool replacing the profit concept. To the extent that

ASSUMED MANUFACTURING CO., INC.

Analysis of Selling, Advertising and Shipping Expenses
Year Ended December 31, 1953

	Per Statement	Pool	Distributed	Type of Charge by: Territory	Product	Salesman
Selling and advertising expense:						
Salaries:						
Officers' salaries	$ 50,000	$ 50,000	$ ---	---	---	---
Salesmen's salaries	80,000	---	80,000	A	B	A
Other salaries	140,000	60,000	80,000	B	A	B
Sales engineers	50,000	---	50,000	A	B	B
Service salaries	30,000	---	30,000	A	A	B
Commissions:						
Salesmen	160,000	---	160,000	A	A	A
Distributors and agents	165,000	---	165,000	A	A	---
Advertising	90,000	50,000	40,000	B	A	B
Branch office expense	20,000	---	20,000	A	B	B
Automobile expense	5,000	---	5,000	A	B	A
Miscellaneous	30,000	15,000	15,000	A	B	B
Rent	25,000	10,000	15,000	A	B	B
Stationery and supplies	10,000	5,000	5,000	A	B	B
Telephone and telegraph	15,000	10,000	5,000	A	B	B
Travel	40,000	10,000	30,000	A	B	A
Depreciation	10,000	10,000	---	---	---	---
Total	$ 920,000	$ 220,000	$ 700,000			
Shipping expenses:						
Freight out	$ 50,000	$ ---	$ 50,000	A	A	B
Warehouse salaries	30,000	---	30,000	A	B	B
Other warehouse expense	20,000	---	20,000	A	B	B
Miscellaneous	5,000	5,000	---	---	---	---
Total	$ 105,000	$ 5,000	$ 100,000			

A - Direct charge
B - Indirect charge

EXHIBIT 1

joint costs would be included in the common pool, the problem of allocating such costs would have been avoided.

A difference obvious here is that, in the case of multi-division companies which treat divisional earnings as pool contributions, divisional expenses, which constitute costs for reporting purposes, will probably account for 98 per cent or more of total costs, and executive office costs are of so little importance that failure to allocate them to operating divisions is a matter of little significance. On the other hand, in reporting on distribution activities (products, sales territories, salesmen, etc.) the situation is reversed. Here the costs which represent direct costs for reporting purposes may be of relatively little significance in the total distribution picture. As previously noted, expenses which constitute direct costs in relation to territorial distribution may become joint costs when viewed from the standpoint of product or salesman.

This problem could be simplified if the black and white distinction between universally recognized direct and indirect costs of distribution were shaded by an intermediate area of quasi-direct costs. As to these there could be no universality of treatment. The "gray area" costs would necessarily reflect the policies and experience of the individual enterprise. For internal reporting

purposes, costs falling into this category would represent joint costs subject to allocation but, here again, the problem can be simplified by allocating such expenses on a studied predetermined basis, subject to change only in the case of basic changes in distribution policies or in underlying conditions.

The Solution Illustrated: Case Background

There follows, in highly simplified form, an illustrative approach to the problem of adapting conventional accounting to the needs of management in the field of distribution control. For ease of understanding, the case study method of presentation, familiar to students, has been utilized, in full recognition of the vast gulf between text-book theory and actual practice.

The Assumed Manufacturing Company is a producer of industrial machinery. Its regular output consists of three loosely-related products, one of which is standardized, while the other two normally require some degree of modification to meet the needs of individual customers. A fourth newly-developed product has recently been introduced. Pricing is firm and, in all cases, is f.o.b. destination. For each of the three regular products, a headquarters sales manager with a small staff is employed, reporting to the vice president in charge of sales. Three territorial branch offices are maintained, each under the direction of a branch sales manager who also functions actively as a salesman. A centrally located warehouse is operated in each territory (north, central and east). The company is represented in the south and west by distributors located in the larger centers and by agents in a few smaller communities. A staff of trained salesmen is stationed in each territory, most of whom receive a base salary plus commissions based on volume. Service men are attached to each branch office and sales engineers operate on call from the headquarters office. Distributors and agents receive a fifteen per cent commission on their sales and assume all distribution functions except that of delivery. Sales engineers assist the distributors when the situation warrants.

Branch offices submit a monthly statement of operations to the headquarters office, supported by copies of the monthly reports of individual salesmen. Copies of these statements and reports are distributed to product sales managers and to the vice president in charge of sales. Accounts are maintained in the conventional manner, with some functionalization appearing as a remnant of an almost forgotten attempt to determine product profitability, long since abandoned because of continuous complaints from product sales managers, to the effect that "The more sales I make, the more overhead I have to carry." Stockholders have been satisfied for ten years or more with condensed financial

ASSURED MANUFACTURING CO., INC.

Pool Contribution by Territories
Year Ended December 31, 1953

	North	South	Central	East	West	Total
Sales	$ 2,500,000	500,000	$ 3,700,000	$ 2,200,000	600,000	$ 9,500,000
Cost of sales	1,880,000	360,000	2,800,000	1,610,000	450,000	7,100,000
Manufacturing profit	620,000	140,000	900,000	590,000	150,000	2,400,000
Shipping expense:						
Freight out	10,000	5,000	15,000	10,000	10,000	50,000
Warehouse salaries	10,000	---	10,000	10,000	---	30,000
Other warehouse expense	5,000	---	10,000	5,000	---	20,000
Territorial gross profit	595,000	135,000	865,000	565,000	140,000	2,300,000
Direct territorial charges:						
Salaries:						
Salesmen	30,000	---	25,000	25,000	---	80,000
Sales engineers	15,000	3,000	16,000	12,000	4,000	50,000
Service	10,000	---	10,000	10,000	---	30,000
Commissions:						
Salesmen	50,000	---	65,000	45,000	---	160,000
Distributors and agents	---	75,000	---	---	90,000	165,000
Branch office expense	5,000	---	10,000	5,000	---	20,000
Automobile expense	---	---	5,000	---	---	5,000
Miscellaneous	5,000	---	5,000	5,000	---	15,000
Rent	5,000	---	5,000	5,000	---	15,000
Stationery and supplies	2,000	---	2,000	1,000	---	5,000
Telephone and telegraph	1,000	---	2,000	2,000	---	5,000
Travel	10,000	2,000	10,000	5,000	3,000	30,000
Total direct charges	133,000	80,000	155,000	115,000	97,000	580,000
Joint territorial charges:						
Other salaries	25,000	5,000	25,000	20,000	5,000	80,000
Advertising	10,000	5,000	10,000	10,000	5,000	40,000
Total joint charges	35,000	10,000	35,000	30,000	10,000	120,000
Net Contribution	$ 427,000	45,000	$ 675,000	420,000	33,000	$ 1,600,000
Per sales dollar	17¢	9¢	18.2¢	19.1¢	5.5¢	16.8¢
Per cent of total contribution	27%	3%	42%	26%	2%	100%

EXHIBIT 2

reports showing operating profits averaging 20 per cent or more on a constantly expanding sales volume. Management, while keeping close watch on plant efficiency, has been content to utilize comparative sales ratios and comments by the firm's public accountants, as guardians of the efficiency of distribution.

The condensed report for the year ended December 31, 1953 shows a less satisfactory picture than heretofore:

Sales	$9,500,000	100.0%
Cost of sales	7,100,000	74.7
Manufacturing profit	2,400,000	25.3
Selling and advertising	920,000	9.7
Shipping expense	105,000	1.1
Administrative and general expense	225,000	2.4
Operating profit	$1,150,000	12.1%

In the face of a bothersome sales decline largely resulting from completion

of defense orders, the manufacturing profit ratio has declined only slightly below the level of past years and, satisfied with the factory picture, management turns to its more detailed internal reports on distribution activities for indications as to corrective action in this field:

		% OF SALES
SELLING AND ADVERTISING:		
Salaries		
Officers' salaries	$ 50,000	0.5%
Salesmen's salaries	80,000	.8
Sales engineers	50,000	.5
Service salaries	30,000	.3
Other salaries	140,000	1.5
Commissions		
Salesmen	160,000	1.7
Distributors and agents	165,000	1.7
Advertising	90,000	1.0
Branch office expense	20,000	.2
Automobile expense	5,000	—
Miscellaneous	30,000	.3
Rent	25,000	.3
Stationery and supplies	10,000	.1
Telephone and telegraph	15,000	.1
Travel	40,000	1.4
Depreciation	10,000	.1
	$920,000	9.7%
SHIPPING EXPENSE:		
Freight out	50,000	1.5%
Warehouse salaries	30,000	.3
Other warehouse expense	20,000	.2
Miscellaneous	5,000	.1
	$105,000	1.1%

Comparison with similar statements covering prior years shows few changes in expense ratio, which are not traceable in major part to the drop in total sales. In dollar amount some categories are slightly higher, though most are lower, than in the previous year. Apart from salaries and commissions, no single classification appears to afford promise that a detailed study and analysis can produce worthwhile cost savings.

The Solution Illustrated: Action Taken

The usual "meat-axe" approach is considered but, upon reflection, the management of the Assumed Manufacturing Company concludes that this might

ASSUMED MANUFACTURING CO., INC.

Pool Contribution by Products

Year Ended December 31, 1953

	Product "X"	Product "Y"	Product "Z"	Product "ZA"	Total
Sales	$ 2,500,000	$ 1,500,000	$ 5,000,000	$ 500,000	$ 9,500,000
Cost of Sales	1,750,000	900,000	4,000,000	450,000	7,100,000
Manufacturing profit	750,000	600,000	1,000,000	50,000	2,400,000
Freight out	10,000	10,000	25,000	5,000	50,000
Product gross profit	740,000	590,000	975,000	45,000	2,350,000
Direct product charges:					
Other salaries	20,000	20,000	40,000	---	80,000
Service salaries	5,000	5,000	20,000	---	30,000
Commissions:					
Salesmen	25,000	20,000	100,000	15,000	160,000
Distributors and agents	45,000	30,000	90,000	---	165,000
Advertising	10,000	10,000	10,000	10,000	40,000
Total direct charges	105,000	85,000	260,000	25,000	475,000
Joint product charges:					
Warehouse expense	10,000	10,000	30,000	---	50,000
Salesmen's salaries	10,000	10,000	60,000	---	80,000
Sales engineers	20,000	20,000	---	10,000	50,000
Branch office expense	5,000	5,000	10,000	---	20,000
Automobile expense	1,000	1,000	3,000	---	5,000
Miscellaneous	3,000	3,000	9,000	---	15,000
Rent	4,000	3,000	8,000	---	15,000
Stationery and supplies	1,000	1,000	3,000	---	5,000
Telephone and telegraph	1,000	1,000	3,000	---	5,000
Travel	5,000	6,000	14,000	5,000	30,000
Total joint charges	60,000	60,000	140,000	15,000	275,000
Net Contributions	$ 575,000	$ 445,000	$ 575,000	$ 5,000	$ 1,600,000
Per sales dollar	23.0¢	29.8¢	11.5¢	1.0¢	16.32¢
Per cent of total contribution	36%	28%	36%	---	100%

EXHIBIT 3

well lead to serious damage in this current period of intensifying competition and that truly effective knowledge and control of its distribution activities can be obtained only if its present accounting techniques are modified. The need for recurring data as to the relative profitability of its three major products under changing conditions is emphasized, as is the need for organized and usable information on territorial activities.

The vice president in charge of sales expresses the desirability of obtaining better control over the operations of individual salesmen. The controller claims that, if such data can be obtained on a consistent basis at regular and timely intervals and if the distinctions between those costs of distribution which follow the activity and those which attach to the business itself, as well as those in the intermediate areas, can be clearly reflected in the accounts and in the reports

prepared for management, then, additionally, many of the technical difficulties attaching to the budgetary control of distribution will have been overcome.

(Complete functionalization of the distribution accounts would be a logical initial step under these hypothetical circumstances, but for the purposes of this illustration a sufficient degree of functionalization has already been postulated. Likewise, since the purpose of this example is to deal solely with the expenses of distribution, the relationship between such expenses and the costs of factory operation has been ignored.)

For the purpose of distribution cost control, the Assumed Manufacturing Company reluctantly discards the concept of product or functional "profitability" and adopts in its stead the concept that each territory, product, salesman or customer should be measured in the light of its contribution to a common pool, the elements of which will consist of the following:

1. Operating profit
2. Administrative and general expense (in practice, numerous elements classified under this category might be found to represent direct or "grey area" charges rather than pool elements.)
3. The following elements of selling and advertising expense, and shipping expenses:
   a. Salary of vice-president in charge of sales.
   b. Other sales salaries, with the exception of the salaries of products sales managers and their staffs.
   c. "Company name" advertising.
   d. Sales administration expenses incurred by the headquarters office.
   e. Miscellaneous shipping expense.

Analysis of results for the year ended December 31, 1953 shows that the expense portion of the pool totals $450,000. Control of pool expenses, which represent in essence the expenses attaching to the business, is recognized as existing apart from control of the costs of active distribution.

The Assumed Manufacturing Company recognizes that, for the purposes of its distribution cost control program, classification of a charge as direct or indirect will depend upon the angle from which it is viewed and not upon the nature of the expense. For example, as shown by Exhibit 1, the salaries of product sales managers and their staffs will constitute direct charges in determining the pool contribution of individual products but will represent indirect "grey area" charges for the purpose of determining the pool contribution of territories or salesmen. Similarly, salesmen's travel expenses will be a direct charge in arriving at territorial or salesmen's contributions but represents an indirect product charge.

The direct contribution of each subdivision of distribution activity must, in effect, be filtered through a subpool of joint charges before its actual contribution can be determined. These indirect charges constitute the distribution cost "grey area" between direct charges and the pool. The Assumed Manufacturing

Company meets this problem by arriving at studied allocations of "grey area" expenses in each instance, with the intent of adhering to the allocation methods originally followed until such time as a radical change in underlying conditions makes a new allocation study necessary. If it should do otherwise, the effectiveness of its planned month-to-month and year-to-year comparisons would obviously be diminished.

Exhibits 2 and 3 present the company's determinations of the pool contributions made by each territory and by each product. Determinations with respect to individual salesmen are not shown, but the underlying techniques are identical. The Assumed Manufacturing Company intends that the data developed through analysis for the year 1953 will in the future be developed monthly through the regular operation of its accounting system, and contemplates that reports as to contribution by territories, contribution by products and contribution by salesmen will support the regular monthly statement of operations. The contributions of individual customers, if required, can be developed through further analysis.

Method Supplies Significant Information

Even a cursory glance at Exhibits 2 and 3 will indicate that this is not the only area in which the Assumed Manufacturing Company must apply analytical techniques in respect of its distribution activities. For example, the contribution of the "west" distributorships is considered highly unsatisfactory in view of the recent industrial growth of that area. However, accounting alone cannot show whether there exists sufficient market potential to support a territorial organization in place of the present distributors, nor can it indicate the future prospects of the newly-developed product "ZA." What it can do, and what it does do for the Assumed Manufacturing Company, is to place before management well-organized and recurrent data sufficient to permit the spotting of areas in which corrective action is indicated, and equally sufficient to allow intelligent appraisal of the effect of alternative choices of action.

What Production Planning Can Do for Cost Control

by EARL L. PETERSEN

Chief Industrial Engineer and Production Controller, Ingersoll Products Division, Borg-Warner Corporation, Kalamazoo, Mich.

A production schedule prepared to meet customer order requirements, as the sole determinant, may impose irregular volume on the manufacturing plant when converted to machine and man hours. Outlined in this article is a plan through which this conversion can be accomplished as a step in setting up a final production schedule for any period in advance for the year ahead. From this a weekly manufacturing schedule is derived with the two-fold purpose of maintaining an even production load and allowing for flexibility in short-range planning.

A GOOD COST CONTROL PROGRAM will incorporate directly or indirectly all basic fundamentals of budgetary control. However, it must also be recognized that there are included in all total factory costs a series of cost elements, some of which are not regularly itemized in budget reporting. The source or real influence of these costs must be examined if they are to be reduced.

Important Cost Considerations Often Lightly Passed Over

Let us examine a few of these elements of cost and see how production control might improve the processes and decrease costs.

Labor turnover may be named first. The cost of hiring and training a new employee is high. There are many factors such as the quality of supervision, wage rates, wage policies, working conditions, and status of the labor turnover caused by peaks and valleys in plant production schedules.

Setup of change-over cost is another such cost. Almost every time an employee is moved from one job to another or machinery or equipment is changed-over to produce a different part or assembly, there is a delay or a setup cost. In the case of production lines or manufacturing processes involving either several or complex pieces of equipment, these setup or change-over costs become a major item in the list of factory costs.

Productivity, itself, may be distinguished as a cost consideration. To obtain the greatest productivity possible, it is necessary to realize the highest physical volume per man-hour and per machine-hour. Much of the responsibility for a high degree of productivity lies with the supervisors of factory operations. However, their effectiveness is considerably enhanced when they are permitted to

operate with the assistance of sound production scheduling practices. Whenever possible, work should be scheduled to enable the supervisor to use to advantage the balance of individual abilities and machine capacities in his department. Without planning, a schedule may call for more production than a given type of equipment can produce, while, on other occasions during the same period, this equipment may be idled many times.

Overtime premium is a cost factor of importance. When the schedule cannot be met without working overtime, we often accept this expense as an unavoidable evil. Again, however, the plant production schedule should be recognized as one of the causes for such overtime costs even though in normal practice plant supervision accepts this responsibility.

Inventory-size involves costs. The amounts of raw material inventory, as well as in-process and finished goods inventories, are governed by how soon production of a unit can be started, how long it will require to be processed, and how soon it can be shipped. Customers' shipping demands must be met. However, unless such demands are properly examined and co-ordinated with the production of other parts, the resulting schedule may cause an abnoramally high inventory.

There are other costs, frequently given only passing attention, such as those involved in long range tooling and maintenance programs. If a master production schedule can be relied upon, the tool engineering and maintenance departments can plan their work more efficiently at a lower cost.

Where Does the Production Control Function Stand?

Each of the elements of cost cited above may be wholly or partially controlled by production control. Thus, we should look to this department for assistance and assign it the responsibility for the control. Production control is simply the application of plain common sense to responsibilities with increasing productivity and reducing operating costs. It consists of obtaining certain basic necessary facts and then planning on the basis of those facts.

While production control should, in fact, control and assume responsibilities that belong with such control, it also needs cooperation to be effective. It needs the understanding and cooperation of management personnel who must realize the relative importance of this function in the overall success of the manufacturing enterprise and must support its functions, provided of course it is assuming its responsibilities in the most efficient manner possible. Cooperation of the Sales Department is also needed. Only with this cooperation, can customer requirements be met with convenience and minimum cost to manufacturing. Sales

department personnel must realize at all times that unnecessary cost added to one order because of an adament stand, very often results in adverse effects on the cost and completion of many other orders. Factory supervision likewise must give cooperation. While operating supervision should be allowed some freedom in production matters, production control, as such, must eventually control production in every phase, to be effective.

Plan in Advance

Advance planning is the foremost requisite in all production control. Without advance planning, scheduling results in a constant state of confusion and quite often proves to be an obstacle to efficient production instead of an aid. No matter what the nature of the operation or the product may be, advance planning is not only possible but necessary. Even in the case of the job shop, where it is not known what has to be produced until the customer's order is received, a master plan of some form can be prepared.

The advance planning by the production control department is reflected in the master schedule. Before any detailed planning can be done, a general plan must be determined. Thus, all open orders should be grouped on a Preliminary Master Schedule, as illustrated in Exhibit 1. This preliminary schedule should cover as long a period as is practical for the plant. If at all possible, an advance period of one year should be recorded. This permits seasonal fluctuations to be high-lighted in each schedule. The preliminary schedule should be prepared in strict accordance with the shipping dates requested by customers.

At this point, many firms make a serious mistake. Regardless of the peaks and valleys in production volume and the effect that such a preliminary schedule may have upon the plant, the assumption is often made that this master schedule exactly represents all customer demands and must be followed to the letter. Instead, such data should only be the initial basis for the real planning.

All master schedules must first be prepared showing units scheduled. These individual product units, except in certain continuous-process industries, contain wide variations in the amount of man-hours or machine-hours necessary to process them through the plant or any given department. To determine the real production load, we must convert these units to total man-hours or machine-hours before any final issue of a master schedule is prepared and released.

To compute such production loads, it is necessary to have a rate of production or a schedule standard applicable to the unit schedule, which also recognizes the normal daily factors that enter into the overall employee and equipment performance. For example, if wage incentives are used, employees' performances will improve and a stepped up rate of production because of the

MASTER SCHEDULE (Preliminary)

FOR A
Product Class

ISSUE NO. 2 DATED 3/1/54

CUSTOMER	PART NO.	CUST. ORD. SHOP ORD.	ORDER QTY.	SHIPPED TO DATE	ON HAND	BAL. TO PROD.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.
U.S. Mfg.	X-461	931 2-49	10,000	2,500	500	7000	2000	2000	2000	1000					1000			
" "	"	932 2-57	10,000	--	--	10000				1000	2000	2000	2000	2000	(1000)	(2000)	(2000)	(2000)
" "	X-462	934 2-58	50,000	--	--	50000		10000		10000		10000		10000		10000		(10000)

( ) Not in firm schedule until order confirmation is received.

EXHIBIT 1

DEPARTMENTAL LOAD ANALYSIS

DATE 3/1/54

No. 5 Assembly

PERIOD FROM 3/1/54 TO 6/30/54

Department

CUSTOMER	ASS'Y OR PART NO.	SHOP ORDER NO.	ITEM	HOURS PER UNIT	Period: March SCHEDULED No. Units	Hours No. Hours	Period: April SCHEDULED No. Units	Hours No. Hours	Period: May SCHEDULED No. Units	Hours No. Hours	Period: June SCHEDULED No. Units	Hours No. Hours
U.S. Mfg.	X-461	2-49	Total Man Hrs.	1.10	2000	2200	2000	2200	2000	2200	1000	1100
"	"	2-57	"	1.10							1000	1100
"	X-462	2-58	"	.15			1000	150	10000	1500		

EXHIBIT 2

MASTER SCHEDULE (Final)

FOR A
Product Class

ISSUE NO. 3 DATED 3/2/54

CUSTOMER	PART NO.	CUST. ORD. SHOP ORD.	ORDER QTY.	SHIPPED TO DATE	ON HAND	BAL. TO PROD.	- SCHEDULED MONTH OF - MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.
U.S. Mfg.	X-461	931 2-49	10,000	2500	500	7000	2000	2000	2000	1000					1000			
"	"	932 2-57	10,000	--	--	10000				000	2000	2000	2000	2000	(1000)	(2000)	(2000)	(2000)
	X-462	934 2-58	50,000	--	--	50000		10000	10000			10000		10000		10000		(10000)

( ) Not in firm schedule until order confirmation is received.

EXHIBIT 3

MANUFACTURING SCHEDULE

ISSUE DATE 2/26/54
WEEK FROM 3/1 TO 3/5
DEPT. No. 5 Assembly
FOREMAN Nick Doe

CUSTOMER AND/OR PART NAME	PART NUMBER	PROD. ORD. SALES ORD.	OPERATION	NO. OF PIECES	T I M E	3/1 MONDAY DAY	3/1 MONDAY ACCUM	3/2 TUESDAY DAY	3/2 TUESDAY ACCUM.	3/3 WEDNESDAY DAY	3/3 WEDNESDAY ACCUM.	3/4 THURSDAY DAY	3/4 THURSDAY ACCUM.	3/5 FRIDAY DAY	3/5 FRIDAY ACCUM.	SATURDAY DAY	SATURDAY ACCUM.
U.S. Mfg.	X-461	931 2-49	Final Assy	100	S A	100	100	200	300	100	400	100	500	100	600		
A.A. Eng.	2731-B	361 2-53	" "	375	S A	75	75	150	225	75	300	75	375				

EXHIBIT 4

application of such wage incentives should be recognized in all schedules. Whenever machinery is involved, there is also the factor of the number of hours that such equipment can be expected to be actually producing each day. In other words, routine maintenance, legitimate delays, and setup time may limit a piece of equipment to only 90 per cent performance, even though the delays are small and only occur intermittently.

To arrive at a schedule standard for use in converting unit schedules to man-hour or machine-hour load analyses, the following formula can be used:

$$\text{Schedule hours per piece} = \frac{\text{Standard hours per piece (by time study)}}{(\text{Average \% employee performance}) \times (\text{\% Machine operating time})}$$

For example, if standard hours per piece were .010 (100 pieces per hour), average employee performance 125 per cent, and the machine could be expected to run on production only 90 per cent of the time the formula would be as follows:

$$\text{Schedule hours per piece} = \frac{.010}{125\% \times 90\%} \text{ or } .0089 \text{ (112 pieces per hour)}$$

Constant use of these schedule hours per piece or unit will prove the accuracy of the figures used in the formula. If the various load analyses immediately result in schedules that consistently match actual plant production volume, the schedule hours used should be recorded in the production control department records for repeated use. If they do not, each of the two percentages used should be rechecked carefully and the formula recomputed until the application in the load analysis consistently works out in practice. Any schedule that either cannot be met or is always completed in advance is not a good schedule.

Analyzing Production Load by Departments for Coming Quarter

After the above formula has been applied in the case of each unit on the schedule, we then have the basic figures for converting the unit schedule to hour schedules. This extension is shown in the Departmental Load Analysis (Exhibit 2). It will be noted that, while the same part numbers appear, the load analysis covers a shorter period than that of the master schedule. While it is important to have a master schedule prepared continuously for a year in advance, it is not practical to extend man-hour or machine-hour loads further in advance than a three- or four-month period, assuming that all material can be purchased within that amount of lead time. Under each period, the number of units scheduled and the corresponding number of man-hours scheduled are shown. If this were a load analysis for machines, the hours scheduled would be machine-hours. In each case, the total hours is the product of the number of units multiplied by the schedule hours per unit. The departmental load analysis is actually the work sheet for determining the final master schedule. Although the total hours scheduled is the product of the units scheduled and the hours per unit, in actual practice the formula quite often is used in reverse. After the total number of hours to be scheduled has been determined, the individual amount of a certain part is the quotient of the available hours for that part divided by the schedule hours per unit.

In developing the complete or final departmental load analysis, the process of its preparation is repeated over and over again until the resulting schedule accomplishes the following in the best manner possible:

1. Fewest possible production line change-overs.
2. Least possibility of line shut-downs due to material shortages.
3. Customers' schedules satisfied closely enough to avoid shut-downs in their plants.
4. The elimination of overtime needs in direct as well as indirect departments and operations.
5. The maintenance of a balanced production load.

When converting the unit schedule shown in the sample preliminary master schedule in which the hours per unit shown in the departmental load analysis were used, it was discovered that the man-hours required for the next four months were as follows:

March	4,150 hours	May	2,800 hours
April	4,300 hours	June	5,650 hours

It is obvious that such varying production volume would be a needless burden on the factory and should not be so scheduled. Upon examination of units on hand and recognizing the possibility of making one or two calls to the customers involved, it is assumed in this illustration that such overall action results in our being able to revamp the schedule to that shown in the departmental load analysis. It will be noted that the scheduled man-hour load now totals 4,000 hours monthly over each of the next four months. In actual practice, the monthly load analysis will vary as the number of working days in each month vary. However, for simplicity in this study, such variation has been ignored and all months have been treated as being of equal length.

As each new load analysis is prepared, trends upward or downward can be detected many months in advance, allowing an orderly and planned approach to such changes. Sudden or unexpected changes, which might cause a labor turnover, should be avoided at all times because they are costly and place an unnecessary burden on plant supervision. The departmental load analysis illustrated in Exhibit 2 was prepared for man-hour requirements. Whenever major machinery is involved, the same type of analysis should be prepared for each piece of equipment on the basis of machine-hours per unit.

Final Production Schedule; Weekly Manufacturing Schedule

The final master schedule (Exhibit 3) can now be prepared. The first four months are, of course, identical with that shown on the departmental load analysis, since it was the result of this load analysis. Beyond this four-month period, the master schedule will continue to reflect only the ordered or contemplated needs of the customers. However, as each month goes by, one month is dropped and another month is added to the four-month analysis so that current

operating schedules are always based upon realistic planning for the four months immediately in advance. It is even necessary at times to break down the load analysis for the coming month into weekly analyses. A comparison of the preliminary master schedule with that of the final master schedule will reveal that the monthly schedule figures have been changed for many of the units listed. In spite of the adjustments made, no customer will be penalized and production is now on a balanced basis.

With the master schedule now completed, it should be prepared and distributed to all departments which may be affected or must plan activities in accordance with it. However, in actual practice it is not normally used as the daily or weekly schedule to be followed, but rather as a guide for preparing daily and weekly manufacturing schedules. An example of such a schedule is shown in Exhibit 4. Many companies have these forms printed on hectograph master sheets so that not only the production and schedule data recorded thereon is reproduced but the entire form itself is reproduced. This process permits the use of the same form as a daily production report.

A Basis for Planned Purchasing

Final issue of the master schedule is now also the basis for all material purchase planning. It is the authority for the material control clerk to requisition the required materials shown on the bill of material. Each requisition to the purchasing department should show clearly the required quantities and dates of delivery. The master schedule issue number should be shown on the material requisition as well as on the perpetual material record, as the authority for the purchase.

Although the entire master schedule should act as the authority for material purchases, flexibility in the schedule must be maintained. This means that only a certain portion of each master schedule should remain fixed, in order to avoid unnecessary emergency shipments from vendors or excessive purchase parts inventory. Efforts should be made to freeze approximately the first sixty days in each master schedule. This part of the schedule must, of course, be governed by such things at the nature of the operation, type of product, and lead time required by vendors, and will vary from one plant to another.

In the case of materials which are common to all production, such as bulk items in continuous process industries, the scheduling of material deliveries can be held reasonably close to the current schedule. As materials or parts which have special application, are purchased, only the lead time for requisitioning material increases. In connection with purchasing the question of correct lot

quantities comes up. This refers to that quantity which will permit the lowest possible purchase price without distorting inventories beyond that which is practical and economical to maintain. Except by sheer guess, this cannot be done without a master schedule upon which to base such decisions.

A Basis for Keeping Production Flowing

Flexibility in schedules should not be carried to the point at which its effects for sound control will be lost, but a certain amount of flexibility must be maintained at all times. Each time the production manager orally changes any part of the production schedule while talking to a production line foreman or superintendent, he is in practice issuing a new schedule. Such action cannot be avoided entirely, but it should be exercised constructively and not constitute radical departure from the master schedule established. The change should also be transmitted immediately to the person preparing schedules so that they may be kept current at all times. A schedule which has not been revised to meet current conditions is worse than no schedule at all.

In other situations, a certain proportion of the planning should be left up to factory supervisors themselves. There are instances in which it would be too costly to expect the production control department to have a detailed knowledge of every condition in the plant every moment in the day. An example would be a jobbing steel or gray iron foundry. The same flasks are used for making the molds for many different jobs and, on the other hand, several different flasks are very often used for making the same job. It is not always practical to have the location or circumstances of these flasks known at all times. However, by furnishing the foundry supervision with a weekly schedule, the production control staff can secure the production needed first, follow the overall load pattern in the master schedule and still leave a large degree of flexibility with supervision to maintain and improve their efficiency.

The weekly schedule should be broken into two parts. The first part should contain top-priority items for the week. This preferential list, on a load basis, should not exceed 40 or 50 per cent of the planned total weekly production. The second part should include a list of those jobs on the master schedule which are next to be produced but are not necessary for production within the week. It should be equivalent to at least 75 to 100 per cent of the average weekly production. This arrangement permits the foreman to produce the items on the first list in their entirety and yet fill out the available capacity with those items from the second list which best enable him to gain the maximum over-all production and efficiency. It is obvious, of course, that, in succeeding schedules of

this kind, items which may have appeared many times on the second list will automatically move up to the first.

A Part of Over-All Planning

The present study is intended only to illustrate briefly the relative importance of the functions of production control in the overall control of costs. Although specific procedures are described, they should be used only as a guide in a particular situation. Each plant is different in its production problems. Even in plants which are alike in the nature of the processes, clerical and administrative procedures will vary according to the personalities of the people who must administer them.

Too often we research for the one idea or application which will cure all ills. The search is futile. We never find it. Reducing costs, raising plant productivity, increasing sales, and, most of all, improving the profit picture are invariably the result of many small measures properly applied. However, if there *is* one idea to be stressed in this entire paper, it would be *sound planning*. No production control system, regardless of its high degree of organization and procedure, can prove its value without that one ingredient. With it, production control can be an important contributing factor in the over-all program for reducing cost.

Costing Fixed Assets—Review of Considerations*

by T. AMES WHEELER

Controller, Allegheny Ludlum Steel Corporation, Pittsburgh, Pennsylvania

Bearing in mind both the acknowledged purpose of depreciation as an allocation of fixed asset cost and the managerial need for depreciation figures suitable as components of costs for pricing purposes and for significant aspects of profit appraisal, the writer of the present article discusses, balancing considerations, his own company's practice and the condition of general practice in depreciation accounting.

FIXED ASSETS have been with us a long time. Likewise, cost accountants have long been coping with the problem of costing fixed assets for pricing, production and general management purposes. One might think, therefore, that this was at least one phase of accounting which could be tucked away and taken for granted as being settled once and for all. Unfortunately, this is not quite true. Some phases will apparently be forever open to debate, and changes in our economy and management viewpoints have introduced new elements that call for a new look from time to time.

Purposes of Depreciation

Broadly speaking, I think we would all agree that depreciation and depletion in cost accounting represent the attempt to spread the cost of long-life assets over the various accounting periods or units of production for which these long-life assets are used. Regardless of which of the commonly accepted methods of calculating the annual depreciation charges is used, the net result is to include in a company's published statements or internal statements of cost and profit by product line, a reasonable estimate of the portion of the cost of plant and equipment used up or made obsolete during the period.

There is another objective of depreciation which sounds very similar but can be basically quite different under varying economic conditions. This objective is to make sure, insofar as possible, that by providing a proper charge for depreciation, a company will be able to replace its fixed plant and equipment and thus be able to continue in business. Obviously, this objective is im-

* Written before enactment of the 1954 revision of the Internal Revenue Code but including discussion of proposals for higher "early-years" depreciation provisions.

portant. It must be recognized, however, that it has its theoretical side, since the money thus retained from the tax collectors by the depreciation charge is, in practice, more often than not immediately reinvested in expanded capacity rather than set aside as a cash fund for replacement. Thus, there is, for any business, a continuing, somewhat uncertain, balance between the dollars actually available from depreciation and the amount of money being spent for replacements or expansion.

One Company's Practice

There seems to be fairly general agreement on the soundness of these two broad objectives of depreciation charges. On the other hand, when it comes to the practices of incorporating depreciation in internal and external statements and in the utilization of such costs for pricing and production guidance, we can run into quite a bit of variety. As a starting point, I might outline first, what we do in our own company. In Allegheny Ludlum we calculate depreciation on plant and equipment, generally on a straight-line basis, and charge these sums directly to the individual production cost centers to which they apply. These and other costs are then developed into hourly standard cost budgets and, through our standard cost system, are charged to products made with the use of the equipment in these cost centers. Thus, depreciation is fully included both in product costs and inventory values. In doing so, we are following a general policy that, for management guidance, we should furnish reports which represent the total of all costs applying to any individual product.

In our internal statements at Allegheny Ludlum, as a matter of fact, we probably go somewhat further than most companies, in that we spread to products, on a strictly statistical basis, a share of selling and administrative expense, since it is our belief that even these costs vary from product to product and that some breakdown is essential in order to get a true total cost picture.

Other companies may obtain approximately the same result in their cost statements without carrying out this distribution of depreciation charges to individual cost centers. Instead, they may follow a practice of pro-rating such charges as depreciation, insurance, taxes, and similar cost items to product lines on some reasonable basis, such as direct labor hours, after first determining the product costs of direct labor, materials, and variable overhead only. The advisability of following this practice as compared with the more detailed one of making distributions originally to cost centers, would seem to vary from company to company, depending upon the type of operations and products.

Depreciation Treated as a Period Cost Can Mislead

Many other companies, I believe, handle depreciation charges quite differently. Some companies do not include depreciation in their inventory costs at all. They are apparently guided by the principle that depreciation is less related to units of production than it is to the passage of time. It is considered, in other words, strictly a period cost rather than a product cost. According to this line of thinking, since depreciation occurs whether any production is carried on or not, depreciation costs are charged off monthly to cost of sales in the same way as administrative and selling expense.

To the extent that the depreciation which would otherwise be included in work-in-process inventory at the year-end is thus charged off, the reported income of the corporation is reduced. In many instances, I believe, this treatment is allowed for tax purposes, possibly more because it represents a consistent and long-standing practice of the company rather than because it is strictly in line with the Internal Revenue Service's regulations and the practices recommended by the accounting profession. Companies following this practice, therefore, derive a definite tax advantage, in that taxes are indefinitely postponed on profit equivalent to the amount of depreciation charges which are currently written off rather than included in year-end inventories.

Carried to its logical conclusion, this view of depreciation and similar charges as period rather than product costs results in direct costing, about which there has been much discussion in recent years. As is generally known, companies using a direct costing method allocate to products only the variable cost elements of direct labor, direct material, and the estimated directly variable portion of overhead costs, such as supplies, fuel and power, etc. The remaining overhead, or fixed portion, is not treated as product cost but is handled like selling and administrative expense and appears as a lump sum figure for all products, which different products of the company will absorb in varying degrees but which must be covered by the "variable profit" from all products if the company is to survive.

Without going into the numerous pros and cons of direct costing, it would appear that, to the extent that depreciation is an important element of the company's costs, the statements of product costs furnished to management under this method could be misleading or inadequate. Let me illustrate with a concrete example. In our company, we have recently completely revolutionized our method of making stainless sheets through the installation of a much larger and more efficient hot-strip mill and new cold-rolling equipment to produce sheets in continuous coil form. Production from antiquated and fully depre-

ciated hand mills, has now been curtailed with a sizable reduction in direct labor costs. Under direct costing methods, therefore, the product costs shown in our statements would indicate a very substantial reduction, while the unallocated fixed overhead costs would show an increase by reason of greatly increased depreciation charges. Without the distribution of these greatly increased depreciation charges to cost of stainless sheets, management would be obtaining a far more favorable picture of the results of the installation of this very expensive equipment than would actually be the case. Instances of this type would make us hesitant to swing completely over to a direct costing method of handling depreciation charges.

Proposals for Recognizing Early Impact of Depreciation

Another problem somewhat similar to amortization may soon have to be faced by cost accountants if depreciation policies of the Internal Revenue service are changed in line with arguments now receiving a more favorable hearing in Washington. I refer to arguments presented by such companies as United States Steel Company and Jones & Laughlin Steel Corporation for the allowance for tax purposes of greater percentages of depreciation during the early years of the life of fixed assets. One of these proposals is that the company should be allowed to write off 50 per cent of the cost of an asset in the first quarter of its useful life and 75 per cent in the first half, with the remainder of 25 per cent to be depreciated over the remaining useful life of the asset.

Accountants may, therefore, soon have to decide how much greater depreciation charges will be handled in costing for production and pricing purposes. In some ways, the problem seems similar to that of accelerated amortization. By this reasoning, we should charge out product costs only with that amount of depreciation derived by pro-rating the cost of the asset over the expected useful life in the same manner as now allowed for tax purposes, with the difference being handled as a direct charge to cost of sales. On this point, however, I can foresee plenty of argument. If there is general agreement, for example, that the greatest economic usefulness of equipment does actually exist in the early years of its useful life, to the same extent as would be indicated by revised tax allowances, then it would be my guess that most companies will elect to charge depreciation to product costs on the faster write-off basis. The final answer on this question may vary from company to company, depending upon management viewpoints or upon industry and company variables.

A number of companies already feel so strongly on this subject that they are charging to profit and loss, and presumably to product costs, in the form

of "accelerated depreciation" higher depreciation allowances than are permitted by the taxing authorities. While no tax benefit is received under current circumstances, the practice does result in a lowering of published profits and possibly in pressure to maintain prices and minimize dividend payments.

Depreciation Costs Under Inflationary Conditions

It appears that advocates of a change in the tax basis for depreciation, while limiting their proposals to accelerating the write-off of original cost, are also influenced by the effect of inflation on prices of fixed assets. This factor of inflation on the cost of fixed assets plus extremely high tax rates, a steady record of annual wage increases, based in part upon arguments about "excessive" corporate profits, and the necessity of restricting dividends to allow modernization and expansion, have led management to seek new means to state profits in what they feel to be more realistic terms. As a result, a number of important companies are now including depreciation based on replacement or reproduction costs in their internal and external cost and financial statements.

The actual means of making allowance for replacement cost depreciation in business costs need not be particularly complicated. Methods currently used by those experimenting with this type of accounting apparently vary quite widely, although they tend to be based upon various indexes of the rise in building and equipment costs. In the case of at least one company with which I am familiar, such replacement depreciation costs are reflected directly in product costs, to force continual attention to the need for higher prices than might otherwise be obtained and to keep management fully aware of the so-called "actual" cost of doing business. Since this extra depreciation cost is not allowed for taxing purposes and is also not approved by the public accounting profession, the result is that in the published financial reports of those companies using replacement costs, the amount of the difference from normal depreciation must be credited back to income and shown merely as an allocation of earned surplus without changing the published net profit of the company, except in a sort of footnote fashion.

Objections to Reproduction-Cost Depreciation

Despite the undoubted soundness of the objectives which corporations seek through the introduction of reproduction cost depreciation, there are a great number of arguments against venturing into this type of accounting under present circumstances. In the first place, the attitude of public accountants and

taxing authorities does much to minimize the sought-for benefits. Even with the most highly-qualified management, furthermore, it is extremely doubtful that we now have any reasonable means of estimating currently any accurate measure of replacement values. In addition to the uncertainties of future price levels, the unknown variables of replacement dates and types of equipment which will be purchased at these future dates must be taken into account. It is generally true that equipment is rarely replaced in kind. New equipment tends to be not only more efficient but greater in capacity. Hence, it would require a better than average crystal ball to determine the extent to which a company may suffer from present original cost depreciation methods, even though there is no doubt that inflation is actually resulting in overstatement of "real" profits, based on future fixed asset costs.

The real proof of the pudding as to the advisability of using reproduction depreciation is found in the experience of companies which have actually experimented with it. An extensive survey by the Harvard Business School, (*Depreciation Adjustments for Price Changes* by E. Cary Brown, 1952) indicates that little success is being achieved in accomplishing the desired objectives. This survey found that most of the company officials interviewed believed that replacement depreciation accounting actually accomplished little or nothing in the way of holding down wage increases. Only a few officials believed that changes in depreciation policy had any effect on prices. And finally, most of the executives believed that the added depreciation was only one of many factors which determined the amount of dividends paid.

In any event, it is possible that at least equally effective results might be accomplished by more simple means. If it were considered necessary to recognize higher replacement costs in a company's pricing policies, statistical or economic studies unrelated to internal cost systems or published earnings could be made fairly simply to arrive at an equally accurate additional overhead factor by which to adjust costs furnished for pricing purposes. Likewise, in published statements of earnings, written explanations or perhaps memorandum revisions of book earnings would seem to be just as effective in influencing unions or stockholders, at least as compared with the present allowable practice of showing additional reproduction depreciation as merely an appropriation of surplus. So far as the influence of reproduction depreciation upon directors in determining the amount of dividends to be declared, financial forecasts of cash requirements and needs for further investment in capital equipment would seem to be a much more effective means of influencing management to maintain adequate reserves.

Costs Reported Must Match the Requirements of the Problem

All of this discussion covering inclusion or exclusion of normal depreciation, amortization, accelerated depreciation, and reproduction-type depreciation in internal and external corporate reporting has presupposed the beneficial use of such costs in regular, monthly reports of product line costs furnished to plant or top management. Such reports are essential as a broad guide and check on operating and pricing policy results, but it is important to recognize that they are frequently inadequate to answer specific questions which actually help to determine pricing and production decisions. Instead, such decisions more often require special analyses derived from our basic cost systems but adjusted to meet the specific problem involved.

There are many reasons for this. In the first place, no matter how good a cost system a company may have, it is very doubtful whether it will provide in its regular reports for sufficient detail by grade, size, type, finish, and processing of products to answer specific questions on specific products. Furthermore, the costs included in these broad statements represent a mixture of cost elements. Material and labor costs are averages of past history. The equipment and processing costs likewise may be averages of a great variety of old and new facilities with which our plants are equipped. The costs in monthly reports, moreover, tend to be accidental costs. By this, I mean that they include the accounting results of a great variety of actions in a particular period, which may be of no significance for the future. They may, for example, include major maintenance and repair bills of a particular month or they may involve heavy charges due to accidents and breakdowns. No experienced cost accountant, therefore, looks at top level cost reports as anything more than approximation. There is no such thing as a single, true, actual cost for all purposes. To furnish meaningful answers for purposes of operating and pricing guidance, individual analyses of costs for specific purposes must be made to match the required "cost" of a product with the purpose for which it is requested.

The production department, for example, is likely to ask for the guidance of the cost department in determining whether to replace present equipment with more modern and efficient facilities. Obviously, cost estimates on equipment still in the planning stage will require a high degree of investigation, and perhaps imagination also, but even a comparison of the estimated cost of new equipment with that of the total cost of producing on present facilities does not answer the question. In this case, depreciation of the old equipment cannot be considered a factor. It is a sunk cost. The important element is strictly

the difference in the variable costs of the new processing against those of present processing, related to amount of dollars invested in the new equipment.

Similarly, for pricing purposes, we may be asked to furnish the sales department with the cost to be used for a new product. The cost accountant must then answer the question, "What cost?" What volume, for example, is anticipated over which our equipment depreciation should be spread? What type of equipment is to be used? Will the product require new production facilities or will it merely increase the volume on present facilities and thus lower unit overhead costs of all products? Under highly competitive conditions, the sales department may be interested strictly in an out-of-pocket cost or even, in some cases, estimates of costs of competing products. None of these answers can be derived from regularly available cost information.

In the special cost studies required, the factor of depreciation, no matter how handled in regular cost procedures, must be included, excluded, or modified to meet the particular problem involved. Thus, the alertness and intelligence of cost accountants in providing correct and meaningful answers will have far more to do with production and pricing decisions than any particular method of charging the cost of fixed assets to corporate cost.

I would like to sum up this discussion in the following sentences. Cost accountants ordinarily furnish management with two types of costing information for pricing and production purposes. The first consists of regular, monthly product line cost and profit reports to enable management to appraise broadly the results of its operating performance and pricing policies. For this purpose, it is my belief that these costs furnished to management should include normal depreciation, the definition of which may, in the future, be modified to mean a considerably faster write-off of assets in early years. Amortization, however, has no place in such product costs, in my opinion. Likewise, the practice of including depreciation based on replacement values, while designed to meet a sound objective, does not appear particularly practical or effective in at least its present stage of development.

The other type of information furnished for pricing and production purposes takes the form of special analyses for special questions. In such analyses, the treatment of fixed asset costs must necessarily vary with the purpose of the question. Though sound basic cost records are essential, the proper treatment of fixed asset costs will depend far less upon the details of the cost system than the brains and imagination of the individual cost accountant himself.

Would Operations Research Help in Your Company?

by JACK W. DUNLAP

President, Dunlap and Associates, Inc., Stamford, Conn.

After characterizing operations research, naming the principal skills which contribute to it as a technique, and presenting it as high-order team-work, the author of this paper goes on to describe a number of business problems of considerable range, to which it has been helpfully applied, suggesting that these may afford indications of the potential of operations research to business generally.

THE TERM "OPERATIONS RESEARCH" seems to state that research is being carried out on some operating situation. Normally, operations research is concerned with questions or problems which involve entire systems of men and machines. After World War II and again with the cessation of hostilities in Korea, a number of companies found themselves in the unenviable position of possessing capital, a plant, some raw materials, a skilled labor force and an experienced management, but without products for a peacetime economy.

The question of what product or products should be manufactured is complex indeed. When it is posed, the answer depends on many factors and management needs to draw on wide variety of experiences and capabilities to achieve a satisfactory solution. The first step includes the inventory of the skills, experience and know-how of its engineering staff, the assessment of the skills in the labor force, an examination of the capabilities of the equipment and an appraisal of the resources of management. Once this is done, broad groups of products will be seen to be eliminated. The remaining groups then have to be assessed in terms of raw materials, production costs, consumer needs, availability of markets, and consumer acceptance. Decisions have to be made as to whether the product should be self-developed, patents purchased, or whether a well-established product purchased outright.

Mention of these considerations will suffice to show the nature and range of the the problems confronting such companies. No single individual has or can have all the knowledge and experience required to develop sound data on which management can make a positive decision. To provide the necessary data requires a team composed of engineers, production men, finance experts, cost specialists, market researchers, psychologists, and other specialists.

Operations research obviously is not new, for the above questions have always been with us. What is new is a methodology and a growing body of tools which enable us to qualify answers to certain problems which before have been considered qualitative in nature and which enable us also, in certain instances, to express quantitatively the interrelationship of a number of variables in a complicated problem. Thus, the executive who must make the final decision to do or not to do, can base his decision, to a greater degree than ever before, on quantitative facts. I doubt if the so-called intuitive hunches and the judgment of able executives can or should be entirely eliminated but, certainly, the margin of error introduced by these can be reduced by providing factual quantitative evidence.

Operations Research Teams Skills to Evaluate Data and Variables

Later in this article specific examples will be cited of the application of operations research to a variety of problems but, before offering them, it will be helpful to say something about the tools and methods employed in operations research. Statistical methods have provided industry with an armament of tools for handling multivariate problems, testing of hypotheses by probability inferences, the analysis of the contribution of the several variables to the total effect, and methods of measuring relationships between qualitative factors. More and more, we are finding ways to apply the methods of calculus, game theory, linear programming and other branches of mathematics to such practical problems as sales forecasting, determining the optimum number of automatic machines a single operator can supervise, scheduling of work, optimizing the utilization of equipment, inventory control, budgeting of sales promotion, and even improving labor relations.

Often the question is asked, "Must an operations research man be a trained mathematician, statistician, physicist or chemist?" The answer is an emphatic, "No." This does not mean that the techniques of these fields are not useful. On the contrary, men trained in these fields are well-grounded in basic scientific method and possess many of the most powerful tools used in operations research. Operations research is concerned with operations, with the people who perform the operations, the material operated on, and the environment in which the operations are performed. This implies that questions of value as well as questions of fact must be answered. It is necessary, therefore, to draw upon the wisdom and knowledge of psychologists, sociologists, accountants, lawyers and doctors as well as upon men trained in the hard sciences. Not all of these are needed for the solution of any one particular problem. However,

the very broadness of the problems with which operations research is concerned makes it necessary to employ teams to develop satisfactory solutions.

An operations research team is designed to do one thing—solve problems. These may be old problems to which only a partial answer is available or they may be new problems growing out of change. These problems may be set by management or they may be uncovered while searching for answers to tasks set for the team. Justification for establishing an operations research team in a company rests on three factors. First, the team must be provided with a continuous supply of problems on which to work. Secondly, good operations research men are hard to find and, when found, draw good salaries—a substantial overhead item. Finally, their efforts must be directed towards problems most likely to yield substantial returns. Thus load, cost and probable return are the critical factors to be considered. Initially, the load set by management should only demand about three-quarters of the team's time, in order that the team members may seek out and identify other problems. These problems often prove to yield the greatest return to management.

It is almost axiomatic that operations research is a team activity. The individual components of the team should shift from problem to problem for, normally, operations research is concerned with problems drawing on the experience, training, and specialized know-how of more than a single discipline. There is perhaps one discipline which should be a component of most teams, namely mathematical statistics, since the solution of many problems requires the application of statistics and probability theory. This member of the team would not necessarily be the team leader for, more often than not, the leader should be one of the specialists assigned to the particular job. In forming a team, there is one danger which must be avoided at all costs. The team must not be composed of "experts" who are at heart technicians wanting only to know more and more about less and less.

Making Skepticism Pay Off

Perhaps the most important contribution of operations research will turn out to be development of a skeptical attitude towards present procedures and practices. Man is a creature of habit and quickly falls into fixed patterns of performance. Once these are established he finds it difficult and distasteful to question these action patterns. Questions—such as, Why do we do something this way? What would happen if I would do so and so? What effect does this method have on other operations?—force him to dispute the validity of his previous judgment and actions. The frontispiece of an old mathematics

textbook carried an anonymous precept which business and industry might well use as a motto, "That of which you are certain, question first." Translated into an industrial situation this might be restated as "Question the oldest practices, methods, and processes; examine the most costly methods and processes; and study those products which account for the majority of production."

Let us now turn to a series of examples in which operations research methods have been successfuly applied and have resulted in increased efficiency and profit. In selecting these examples, I have drawn, for the most part, from situations in which I have direct first-hand knowledge. The emphasis is placed on the range of situations which the examples typify and no attempt is made to discuss the mechanics of a particular solution. Once a problem area has been delineated and the problem formulated in precise terms, there only remains the operation of bringing together a team of men who have at their command the proper techniques (mathematical, statistical, engineering, or psychological) for its solution.

Examples of Problems Solved: Scrap Inspection

A manufacturer of personal leather goods was concerned over the steadily narrowing profit range in the industry. A quick analysis of the operation revealed that raw materials were an unusually high factor in production costs. A preliminary investigation revealed that, after the required parts had been blanked out, approximately 35 per cent of the leather purchased was thrown away as scrap. A pilot study showed that 50 per cent of the scrap was equal in quality to the leather retained for production. The cutting operation was reorganized, starting with the uncut hides and ending with the final inspection. This resulted in saving as much as 28 per cent of the former scrap or 10 per cent of all leather purchased. This reduction in material costs not only gave an edge in competition but also a satisfying increase in profit.

Another manufacturer of high quality billfolds took great pride in the fact that the company turned out no seconds. This is a false criteria of success. The product was highly regarded by buyers and the ultimate consumer yet, on a gross sales of four million dollars, the profit was only a hundred thousand dollars. The employees were unusually quality conscious and each lot of leather cut was inspected five times. One inspection occurred immediately after the pieces were cut from the raw hides. A sample of 72 covers was taken from the reject box of the chief inspector at this point and numbered one through 72. These were taken to the plant superintendent, the foreman of the cutting room, and the vice-president in charge of operations with the request they

inspect these pieces and show the investigators which were firsts and which were rejects. These men rejected, respectively, 18, 4, and 22 of the previously inspected covers, and, in only one instance, was the same cover rejected by all three. Subsequently, a lot of six hundred covers was numbered and given to 10 inspectors. Of these, 318 covers (or 53 per cent) were rejected by one or more inspectors.

Clearly here was an instance of varying standards of inspection. The rules called for rejecting pieces which were scarred, cut, of improper thickness and softness or which had black spots resulting from droplets settling out of the air in the spray room. Obviously, scars and cuts which appear on the surface of the finished product should be eliminated. However, minor scars and cuts which do not result in weakening the product and which would be hidden do not necessitate the discarding of the piece. The spot problem raised two questions as to magnitude and intensity, i.e., how big is big and how black is black. One finished billfold, retailing at $25 was rejected because of a black spot on the outside cover no larger than a pinpoint. A set of standards was developed, the inspectors trained to meet these standards, and given regular refresher training, with a resulting saving of some 30 per cent. Of particular interest here was the development by an experimental psychologist of psychophysical scales of acceptance as to thickness, softness, color intensity, and size of spots.

A Machine Attendance Problem

The introduction of automatic and semi-automatic machines has posed some interesting questions to management. One of these is "How many machines can a single operator tend?" The answer to this question depends on a number of factors: the kind of machine, condition of the equipment, the need for refilling the machine, change-overs required, set-up time, to mention only a few. The problem is one of minimizing labor costs and maximizing the production of the battery of machines. Studies of machine costs, down-time for maintenance, setup and reloading, costs of rejects due to insufficient inspection, and costs of failure to meet and maintain production schedules must be made. Once the basic data have been procured for these and other critical factors, a mathematical model can be constructed from which one can determine the effects of varying one or more of the factors. This enables the operations research man to provide management with facts on which to make a decision as to the number of machines a given man should operate.

Recently a variant of this problem appeared, in which the disposition of

labor on the first two machine stages of a manufacturering process was at issue. The output of each machine in the first stage was fed to a second-stage machine. For years each first-stage machine received the full attention of one worker, while three second-stage machines were assigned another worker. In order to economize, the workers on the second-stage machines were dropped and each of these machines assigned to the worker of the corresponding first-stage machine. After a time, the work force formally objected to the new assignment as involving serious hardship.

An analysis of the cycles revealed great variation, but examination of the company's control charts indicated these cycle times were in control. The size and distribution of waiting times were such that it was clear to all that one worker could not handle both stages effectively and, if required to do so, would be subjected to considerable anxiety as to breakdowns and other work stoppages of the several machines. Genuine economies could only be attained by redesigning the complete work process, not from increasing worker load as had been attempted.

Queueing and Bottle-Neck Problems

One of the most costly phenomena to industry and business is that of queueing, yet it has received relatively little study. The problem is particularly troublesome in stores and ticket offices, resulting in customer annoyance, lost sales, and inefficient use of personnel. The identical problem exists in industry and appears in the form of bottlenecks on production lines. A few other examples are: payment of claims by an insurance company after a disaster, getting out statements at the end of the month, operation of unscheduled trains on an overloaded transportation system, practice of stacking airplanes in bad weather, scheduling of ore boats at an unloading point, and the loading and getting under way of trucks in the morning.

The answers to some of the problems are obvious. In one instance, the problem on an assembly line was solved by determining which workers had the greatest manual dexterity and assigning them to certain key spots. If the demands for service are well below service capacity, no problem exists but, when the demands approximate the capacity, queueing inevitably results. Not all the problems are presently soluble but many are, some by trial and error methods and some by mathematical techniques which are now avaialble. Queueing theory draws on probability theory statistics, and analytical methods. The most brilliant and effective work done in this field has been conducted by Bell Telephone scientists. They were literally forced to study this problem because of the

demands placed on the system and the tremendous outlays involved in capital equipment.

Phases of Teamwork in Product Development Problems

The production of a new model whether it be a household appliance, a car or a machine tool represents a substantial capital outlay and a corresponding loss to the company if the product fails to achieve consumer acceptance. Management's decision to bring out a new model is the result of many factors aggregating a conviction that a new model will increase the profitability of the operation. This decision, if it is activated optimally, calls for specialists from a number of fields, whose contributions are required at various phases of the development. The first phase calls for a survey of the customers' complaints against the present model. This information can be drawn from company files and from interviews with users. The survey will also cover features of competitors' equipment and customers' reactions to these. It is likewise necessary to determine the additional features customers desire and to establish an order of preference for the features and an index of buyer appeal. This is a task for the psychologist, statistician, and economist specializing in market research.

The second phase is one of engineering the new product in terms of functional performance and in providing the features which management has selected from the list determined in Phase I. The design is more than one of operating efficiency, for such factors as new materials, weight, production methods, and costs are to be considered. This stage may require the knowledge of mechanical engineers, electrical engineers, metallurgists, physicists, material engineers, production engineers, and cost accountants. The work of each of these "feeds back" to the others. If the cost accountant finds production costs will price the new model out of the market, the engineers will have to find ways to reduce costs.

The third phase is to study the new model in terms of the demands its use places on the capabilities and limitations of the user. This is an area designated as human engineering. Are the controls placed so they are readily accessible? Can they be manipulated without undue physical effort, without barking one's knuckles or without assuming an awkward and fatiguing position? Can performance indicators be easily seen and readily interpreted? These are only a few of the factors that the human engineer studies, but they are the factors which, if not properly considered, can result in customer dissatisfaction and word of mouth disparagement of a product, with consequent loss of sales. For-

tunately, specialists can catch most of these defects in the blueprint and mock-up state, so that appropriate changes can be made.

The fourth phase is product design in terms of styling and appeal to the customer. This is the packaging problem and more of an art than a science. Nevertheless, the designer must keep in mind production problems in processing the package and the costs involved. Once again there must be a "feed back" from his work to that of the engineering department, in order to determine the feasibility of a particular product. Frequently, the designer must modify his packages in terms of the engineering requirements.

The fifth phase and perhaps the most important is to predetermine in so far as possible the customer appeal or salability of the product. What factors motivate the customer at the point of sale to select one manufacturer's product from a group of five or six in the same price class? This phase can best be conducted by a psychologist trained in interviewing and in clinical methods for searching out motives, often subconscious, which influence the actions of people. These findings are again fed back to the engineer, the human engineer, and the stylist to enable them to modify the product so as to have maximum appeal to the purchaser.

This team approach to the development of a new model results in a better design, increased customer satisfaction, greater customer appeal, increased profits, and minimizes the chance of failure. The composition of the team will change from product to product and varying degrees of emphasis will be placed on the several phases, but the overall approach is that of operations research.

The Problem of the Dragline

A dragline is a massive piece of capital equipment, often weighing more than a thousand tons and costing in excess of a million dollars. The operating crew consists of three men: an operator, oiler, and roustabout. Obviously, there is little chance to secure substantial savings through decreasing the labor force. Any increase in operating efficiency, even though small, would represent large dollar returns to management. Utilization of this equipment in strip mining is complicated by the infinite variation in the nature of the ratio of ore to overburden, the need to dispose of waste material, the need to build retaining walls for waste water or fills over which to move the equipment, and the limitations imposed by transportation facilities for the ore and the facilities of the beneficiation plant.

In one such instance, a careful analysis revealed twelve major factors the

simultaneous variation of which affected production rates. It proved practical to combine two pairs of variables into new functions, so that only ten variables had to be handled. Even so, if we permitted each variable to take only ten values, the number of resulting combinations would be prohibitive to study experimentally. An alternative would be to construct a miniature analog of the dragline, speeding up its operation approximately a hundred times, but obviously the number of combinations which might occur would still be far too great to handle in this manner. There remained only one possibility, the construction of a mathematical model or formula which would accurately represent any combination of points for the ten variables.

This proved to be feasible and not too difficult a task. The model had to be adjusted for each of the draglines, but its solution involved solving more than a million triple integrals, an impossible task without the use of highspeed electronic computers. The most difficult problem by far proved to be the translation of this mass of numbers into a simple form readily mastered by any layman and which would enable him in a few moments to determine the optimum mining pattern for any given situation. This model has been used in the field now for more than eighteen months with substantial increase in production. Further, the chief engineer of the company informs me that it has not as yet been possible to exploit fully the possibilities of the model and that, when it is, the company expects to secure still another substantial increase in production. This increase in operating efficiency has been achieved without additional capital outlay, without increased manpower, and, curiously enough, with a slight decrease in power costs.

A Technique Which Is Opening Up to Business

The application of operations research to practical business situations cannot be fully treated in a paper or even a book. Rather, the purpose of this article is to alert industrial accountants to the possibilities of scientific method, to illustrate the fields which can be drawn on to assist in solving particular problems and to present a wide variety of examples from industry. This may suggest possible applications in particular companies and demonstrate that advanced mathematics is not always necessary and that large returns in terms of increased efficiency and profit often result from application of these methods. In general, the success of this approach depends on two factors: the formulation of the problem in terms of presently available tools and techniques and availability of suitable data.

How a Hosiery Mill Compiles "Direct" and "Full" Costs

by HOWARD O. WILLIAMS

Assistant Secretary, Adams-Millis Co., High Point, N. C.

The first departmental costs to make their appearance under the system here described are innocent of fixed costs, and these are the figures which, with variance disclosure, underlie the company's monthly profit and loss statement. However, the summarization which is used to arrive at departmental costs without fixed elements, is also re-worked to include them, in order to serve sales department needs.

IN THIS CASE STUDY let us assume that we are the cost accountants for the hypothetical XYZ Hosiery Mill and will establish standards for its use in sales and in record keeping. Since our system is based on the use of direct costs, a short discussion of this relatively new system of costing may be in order. The concept of direct cost accounting is based on the theory that total costs are composed of two separate and distinct parts, first, those expenditures which are incurred in connection with the ability to produce and, second, those costs which occur in producing. These two classifications of costs have been described as period costs and product costs. The period costs, or fixed expenses, are written off currently, leaving only the variable or product costs to become the basis of inventory value and profit determination.

It seems to me that too many of the exponents of the direct cost accounting theory are stressing its use for inventory valuation to the extent that its greatest value—as a tool of management—is frequently overshadowed. My company has, since its organization in 1928, charged off to current expenses all overhead, both fixed and variable, so that it will readily be understood that the question of inventory valuation did not enter into our substantial adoption of this direct costing theory on January 1 of last year. Our principal consideration was its use as a tool of management.

A More Informative Monthly Statement

Nevertheless, there is already favorable evidence at hand. Let me take occasion here to point out a single example, the simplification of our profit and loss statement. One of our larger plants is a seamless hosiery mill operating approximately 1,000 machines. This mill had a total annual knitting depart-

ment overhead budget of $230,000 in 1952, using the conventional standard cost accounting system, our profit and loss statement showed a knitting overhead credit variance of $33,223 or a little over 14 per cent. This seems like a rather large variance but, as any cost accountant would immediately suspect, a substantial portion of this amount, as shown by analysis, represented volume variance, that is, that over-absorption of overhead arising from crediting the variance account with a standard amount based on a production greatly in excess of the established standard. In 1953, after adapting our system to direct costing, this same mill, with an annual knitting overhead budget of approximately $109,900 (omitting fixed costs), showed a knitting overhead variance of $281 or a little over .2 per cent.

An executive studying our monthly reports does not now need to know how our actual production compared with standard. Nor does he require any variance analysis in most cases. The variance of $281 clearly represented amounts expended in excess of standard in producing our commodity and proper steps could be taken to see that such expenses were eliminated or justified. There is no volume variance to confuse the executive in his study of the report. Instead, there are six separate and distinct variance accounts, providing directly helpful information. These are material variances (both quantity and price), direct labor variance, departmental indirect labor variance, overhead variance and, of course, the fixed costs for the month.

However, we will leave the matter there, for present purposes. We will not now take up any more space with a discussion of direct costing nor will we debate the relative merits of direct costs vs. conventional or full costs. These are subjects in themselves. The principal purpose of this article is to demonstrate convincingly the ease and simplicity by which a conventional system can be converted to direct costs, strictly for use in internal reporting and for management information. To do this required very little more work than that required in setting up a new budget using the conventional system.

Industry and Case Background

We operate six plants in various portions of North Carolina. We have approximately 2,000 knitting machines of 28 separate and distinct types. Each of these 28 types of machines makes a different type of product and its burden rate and speed of producing are individual. Our annual production is about 5,000,000 dozen pairs of hose. From this, it will readily be realized that there is some complexity in establishing standards. For illustration, we will consider here a single hypothetical mill which we will call the XYZ Hosiery Mill. This

mill has, for our purposes, 228 knitting machines of four different types. The figures contained in the exhibits to this article are entirely hypothetical.

In order to provide better background with respect to cost-centers in the industry, a word or two of description is in order. The operation begins with the cones of yarn, which might be cotton, nylon or rayon. These raw materials are taken into the knitting department where they are knit on a circular knit hosiery machine, resulting in a product which is like a sock with a hole at both ends. In order to make it into a true sock, the next process, looping, classified as the greige processing department, closes up the toe of the sock. The next department is the dye house where the sock is dyed to the required color. After dyeing, the sock is taken to the boarding department. This operation is nothing more nor less than pressing with steam and heat just as you would a suit of clothes. After boarding, the sock is carried to the finishing department where it is paired and inspected, and where labels, transfers, pin-tickets, etc., are affixed. It is then packed in boxes according to the requirements of customers. After that, it goes to the packing and shipping department for placing in shipping cases and is then sent out. This brief description thus reflects six cost centers.

Establishing Labor Budget Amounts

We are now ready to begin our study of the establishment of burden for the XYZ Hosiery Company. Any period might be used in the establishment of budget standards, weekly, monthly, etc. In the preparation of the budget, we shall use a weekly basis. Our budgets will be based on an assumed production of 80 per cent of capacity. Analysis of prior years' activities indicates that this per cent will closely approximate normal production. Exhibit 1 is the Standard Overhead Budget. The headings of this schedule indicate that costs will be broken down into three main classifications: direct costs, fixed costs, and steam plant expense. The steam plant expense will, at a later point, be redistributed to direct costs and fixed costs.

From the types of machines and their production speeds, assuming an 80 per cent capacity for the next year, the cost accountant has already determined that standard weekly production will be 9,870 dozens. It is a simple task for him at this point, then, to secure the direct labor budget for the same weekly period merely by applying the proper direct labor piece rates to the pre-determined total of 9,870 dozens in the various departments—knitting, greige, processing, boarding and finishing. Dye house labor is all on an hourly paid basis and the number of men required to run the dye house to secure the indi-

XYZ HOSIERY COMPANY — STANDARD OVERHEAD BUDGET

5070 Dozens

	Total	Direct Costs: Knitting	Grey Proc.	Dye House	Boarding	Finishing	Ship	Gen. Fact.	Fixed Costs	Steam Plant
Direct labor	5334.	1599.	1925.	310	650.	850.				
Departmental indirect labor	2225	1275.	250.		75.	500.	125.			
General Overhead Expenses										
Other indirect labor	273								98.	175.
Superintendence	500								500.	
Depreciation	1600.								1596.	4.
Taxes	375.								375.	
Insurance	14								14.	
Shipping cases	100						100.			
Needles, hooks, jacks, etc	265	265.								
Machine repairs and shop	400	360	16.	28	12.	4.				
Building repairs	15								15.	
Fuel	200									200.
Power and lights	70.	31	7.	9.	1.	3.			19.	
Water	35.									35.
Oil	7							7.		
Belting	10.								10.	
Telephone	2								2.	
Truck Expense	5							5.		
Freight and express	5.							5.		
General mill supplies	100.							100.		
Workmen's Comp Ins	10							10.		
Vacation Pay	235							227.	3.	5.
S. S. Taxes	385							350.	27.	8.
Steam plant prorate				214.	128.				85.	342.
General factory prorate		267.	202.	37.	68.	126.	12.	704.		
Total Overhead	4406.	903.	225.	280.	209.	133.	112.		2744.	
Total overhead & indirect labor	8831.	2178.	475.	280.	284.	633.	237.		2744.	
Overhead % to Direct Labor			11.69%		32.15%	15.65%				
Indirect Labor % to Direct Labor			12.99%		11.54%	58.83%				
Total Exp. % to Direct Labor			24.68%		43.65%	74.48%				
Labor Cost Per Dozen				3.14¢						
Indirect Labor Cost Per Dozen							1.27¢			
Overhead Cost Per Dozen				2.8¢			1.13¢			

EXHIBIT 1

cated production has been determined from analysis and by consultation with our superintendents.

Departmental indirect labor is a little more difficult. The budget for this cost element is based on the indicated production for a standard week and is the amount of indirect labor which the cost accounting department and supervisory force have agreed will be required to get out that production. We do not include departmental indirect labor in the overhead figures but carry a separate variance account, since it is a substantial item of cost.

Establishing Expense Budget Amounts

We have now established our direct labor budget and our departmental indirect labor budget. We must now establish our overhead budget. The departmental indirect labor, shown as the second item on Exhibit 1, is indirect labor which is deemed to be fairly variable, that is, it varies with our production. The first item of general overhead expenses is, then, the remaining indirect labor which is of a fixed nature. This covers such persons as general time-keepers, general clerical help and general janitor and maintenance service. It also covers our steam plant employees, those who fire our boilers, etc. Hence, it is distributed to the fixed cost and steam columns of the table.

Superintendence, the next item, is distributed to the fixed cost column. Depreciation, taxes and insurance are all of the same nature—fixed costs which

will be incurred whether we produce or stand idle. They are, therefore, carried over into the fixed cost column. In the case of depreciation, there is a small amount attributable to the steam plant. Depreciation amounts were secured from regular depreciation schedules except that, in the case of knitting equipment replacement costs were used. These are believed to be realistic in that they represent amounts which would be incurred currently to replace a machine that became worn out. We would not necessarily want to replace worn-out equipment with new equipment and might, therefore, buy second-hand equipment. In establishing replacement cost, second-hand equipment prices were used in these instances.

The item of shipping cases is built up from a record of the annual cost for at least the past year and, if necessary, of previous years, divided by total shipped production. In the event of an expected price increase or an expected change in postal regulations requiring more or less shipping containers, this amount would be adjusted. In this particular case analysis indicates that the necessary cost for 9,870 dozens will be approximately $100, and therefore, this amount has been used in the budget.

Needles, hooks, jacks and sinkers are primary parts used in the knitting department. They must be replaced at intervals due to breakage and pattern changes and, in the case at hand, very accurate statistical records for needle breakage and hooks, jacks and sinker usage have been established through the medium of tabulating equipment. Prior to acquiring this equipment, such complete records were not kept, but it is now possible to establish this particular standard with a good deal of accuracy. These are items which are used in the knitting department alone and are shown under direct cost, since the number of needles, hooks, jacks and sinkers used is directly variable with production.

In the case of machinery repairs and shop expense, the budget must be built up by study of prior years' experience and consultation with the supervisory force as to what might be the possible unusual repairs which will take place during the coming year. After being established, this figure is broken down to each department on the basis of years of experience as to how much of machine shop expense is attributable to the various units. Building repairs are carried into the fixed cost column on the basis of prior years' experience.

The item of fuel—another item which is built up from previous years' experience—is carried into the steam plant column. Power and light is divided between direct costs and fixed costs. The fixed portion is for the lighting of the plant, which must go on whether 10 dozen or 1,000 dozen are produced. The distribution to departments and between direct and fixed cost is based on a horsepower conversion, employing the rated horsepower of all motors in each

XYZ HOSIERY COMPANY		KNITTING EXPENSE			
	Total	200 N	186 N	168 N	132 N
Number of Machines	228	100	56	24	48
Production 80% - 2 shifts	9870 doz.	5973	2309	1136	2452
Machine hours - 80%	14592 hrs.	6400	3584	1536	3072
Direct Labor	$ 1599.	648.	376.	158.	417.
Departmental Indirect Labor	1275.	508.	300.	148.	319.
Standard Cost Budget					
Needles, hooks, jacks and sinkers	265.	111.	72.	43.	39.
Machine repairs and shop	340.	149.	83.	36.	72.
Power	31.	14.	8.	3.	6.
General Factory	267.	107.	61.	29.	70.
Total Knitting Direct Costs	903.	381.	224.	111.	187.
Total Direct Costs and Indirect Labor	2178.	889.	524.	259.	506.
Standard Knitting Rate Per Hour					
Overhead		5.95¢	6.25¢	7.23¢	6.09¢
Indirect Labor		7.94¢	8.37¢	9.64¢	10.38¢
Total Expense		13.89¢	14.62¢	16.87¢	16.47¢
Fixed Cost Budget					
Depreciation	1396.	612.	343.	147.	294.
Taxes	238.	104.	58.	25.	51.
Belting	8.	4.	2.	1.	1.
Building expense	70.	31.	17.	7.	15.
General Factory	276.	111.	63.	30.	72.
Total Knitting Fixed Costs	1988.	862.	483.	210.	433.
Add direct costs above	903.	381.	224.	111.	187.
Total Knitting Overhead	2891.	1243.	707.	321.	620.
Total Overhead and Indirect Labor	4166.	1751.	1007.	469.	939.
Sales Cost Rate Per Hour					
Overhead		19.42¢	19.73¢	20.90¢	20.18¢
Indirect Labor		7.94¢	8.37¢	9.64¢	10.38¢
Total Expense		27.36¢	28.10¢	30.54¢	30.56¢

EXHIBIT 2

department and of all lights throughout the buildings. The light consumption was supplied in watts and was then converted to horsepower. While any electrical engineer would probably laugh at this particular system, since there are other factors involved, such as the demand, etc., it is felt that the method is a fairly satisfactory solution to distribution of this particular item.

Water, since it is primarily all used in the steam plant, is charged there. Oil is a variable expense and applies to the general factory category. Telephone expense is a fixed cost item. Belting is charged to fixed cost on the theory that it is a more or less permanent improvement to machines. Truck expense and freight and express are both direct costs or variables. They are charged into general factory expense. General mill supplies is an item built up from a study of past experience and discussions with superintendents and is carried into general factory expense under direct cost. Workmen's compensation insurance is calculated on the current rate applied to direct labor, indirect labor and superintendence payroll. The vacation pay is distributed proportionately to labor in the various divisions of our budget. The same thing is true of social security taxes. These items are very easy to establish since they are based on fixed rates set up, in one instance by the government, and in the other instance by employment contracts.

Closing the Budget Schedules to Get Costing Rates; Cost Procedure

It is now possible to total and distribute steam plant expense which, just as

in the case of power and light, is distributed between direct costs and fixed costs. The portion of the steam produced which is used in the dye house for heating water for its purposes is charged to it. Then, there is a large quantity of steam used in the boarding rooms to heat board forms for the pressing operation spoken of earlier. The remainder of steam plant expense, heating, is a fixed cost. General factory expense may now be totalled and distributed to the various departments on the basis of total direct and indirect labor. After this allocation, all columns on Exhibit 1 are added and crosscast, arriving at a total general overhead of $4,606, broken down into the various departments under direct cost and a portion in fixed cost. Combined with departmental indirect labor, on Line 2 of the exhibit, this gives the total overhead and indirect labor figure for fixed cost.

The percentages of overhead to direct labor in the greige processing, boarding, and finishing departments are then calculated, as shown. For the dye house and the packing and shipping department, a standard cost per dozen is calculated instead, by dividing production into the dollar figures. At this point, there might be said to be a complete standard overhead budget if we were willing to accept the direct labor base in the knitting departments as accurate. However, it will be noted that no computation is shown under the knitting department expense total. Over a period of years, a machine hour cost has been found much more accurate than a percentage of direct labor in the knitting department. This comes about from the fact that certain direct labor rates are set to yield amounts based upon the difficulty that the knitter might have in operating a particular style or possibly, at times, the use of bad yarn and considerations of that nature. This has led to the discard of the direct labor ratio in favor of the more accurate machine hour cost basis.

In order to complete the standard overhead budget, it is necessary, therefore, to figure an overhead rate for the knitting department. This computation occupies the upper section of Exhibit 2. Here are shown again direct and indirect labor in the knitting department. The items amounting to $903 in the first column of Exhibit 1 are brought forward and distributed to the various types of machines, the needles, hooks, jacks and sinkers on the basis of the statistical information, the machine repairs and shop and power expense on the basis of the number of machines, and the general factory expenses on the basis of the total direct and indirect labor in this particular department as divided among the several machines. Totalling the knitting direct cost for each class of machine and adding indirect labor gives amounts which, when divided by machine hours on an 80 per cent basis, supplies the standard knitting rates per hour as shown.

These figures now complete the standard overhead budget and, as far as the

XYZ HOSIERY COMPANY — SALES COST BUDGET

9870 Dozens

	Total	Knitting	Grey Proc.	Dye House	Boarding	Finishing	Pack & Ship	Gen. Fact.	Bldg. Exp.
Direct Labor	5334.	1599	1925.	310	650.	850.			
Departmental Indirect Labor	2225.	1275.	250.		75.	500.	125.		
Fixed Costs									
Other indirect labor	98.							98	
Superintendence	500.							500	
Depreciation	1596.	1396	32	46	37	20		24.	41
Taxes	375.	238	5	9	11.	2		73	39
Insurance	14								14
Building Repairs	15.								15
Lighting	19.								19.
Belting	10	8	2						
Telephone	2							2	
Vacation pay	3							3	
S. S. Taxes	27.							27	
Heating	85.								85.
Building expense prorate		70.	28	17	21	60.	17		213.
General factory prorate		276.	207.	31.	68.	129.	14.	725.	
Total Fixed Costs	2744.	1988.	274.	103.	137.	211	31		
Add direct overhead	1862	903.	225.	280.	209.	133.	112.		
Total Mfg. Overhead	4606.	2891.	499.	383.	346.	344.	143.		
Total overhead & indirect labor	6831.	4166.	749.	383.	421.	844.	268.		
Overhead % to Direct Labor			25.92%		53.23%	40.47%			
Indirect Labor % to Direct Labor			12.99%		11.54%	58.83%			
Total Exp. % to Direct Labor			38 91%		64.77%	99 30%			
Labor Cost Per Dozen				3 16¢					
Indirect Labor Cost Per Dozen							1.27¢		
Overhead Cost Per Dozen				3 89¢			1.45¢		

EXHIBIT 3

mechanics of the cost accounting system is concerned, provide all necessary figures. Fixed charges go each month directly into the fixed cost account. The direct costs are charged from actual expenditures to the various departments, distributed on the same basis as they were in the budget. The standard costs, involving direct costs only, are credited to the overhead account on the basis of production for the period.

"Full" Costs for Sales Department Information

If there were nothing further to consider, we would at this point be through. However, we must be prepared at all times to give our sales department a fast accurate sales cost estimate and, in order to do this, our hypothetical company has carried its budget one step further as shown in Sales Cost Budget, Exhibit 3. This schedule takes the fixed cost items, which were shown in the next to last column on Exhibit 1 and distributes them by departments on the basis of a regular standard cost accounting system. "Other" indirect labor and superintendence is placed under general factory expense. Depreciation is allocated to the various departments on the basis of the depreciation schedules and replacement cost depreciation. Taxes are applied to departments on the basis of valuation. Insurance is taken to building expense. Building repairs go to building expense, as does lighting. Belting is distributed between the knitting department and the greige processing department, the two which use belting.

Telephone is classified as general factory expense and vacation pay and social security taxes also, since they will be distributed later on a labor basis. Heating is regarded as building expense.

The building expense column is then totaled and distributed to the various departments on the basis of floor space occupied. Similarly, general factory expense is added and parcelled out among the various departments on the basis of total direct and indirect labor. Thus, total fixed cost by departments is obtained. Direct overhead for each department is added from Exhibit 1. What is obtained now is again total manufacturing overhead, but, in this instance, the fixed costs are distributed throughout the departments. Once more indirect labor is brought down to get total expenses—and overhead, indirect labor and total expense percentages to direct labor are figured, as well as the per dozen costs for dyeing and for packing and shipping. For the knitting department, the lower half of Exhibit 2 derives from Exhibit 3 the corresponding information which the upper half derives from Exhibit 1, arriving at a sales cost machine rate per hour, including fixed cost, for use in the sales cost budget.

Conclusion

It will be apparent that two sets of cost data are now available, with and without fixed costs. Each is serviceable. The information shown in Exhibit 1 and the upper half of Exhibit 2 is used in our closings and in our internal profit and loss statement. For use in making sales cost estimates for the sales department, the data from Exhibit 3 and the lower portion of Exhibit 2 applies.

Charles R. Chambers, writing of a similar conversion to direct costs in the March, 1952, *N. A. C. A. Bulletin,* made a statement concerning his company's income report which is closely applicable to our own system. Mr. Chambers has this to say in closing—and it will serve well to conclude the present article also:

> "The resulting income statement provides management with a far more understandable picture than before. Some of the information now available could have been made available under the old method of developing full costs but, as mentioned previously, the correlation of this data with the income statement would have been not only difficult, but confusing. The main purposes have been accomplished in that the relationship of profits to sales volume is shown, contribution of marginal products toward the total profits of the business can be measured, and the total of fixed expenses of conducting the business is clearly and definitely portrayed. The computation of 'break-even points' becomes easily understandable, though, in this case, difficult because of different margins."

Newspaper Budgeting for Management Guidance

by WILLIS W. SHENK

Secretary and Controller, Lancaster (Penna.) Newspapers, Inc.

Illustrative figures distinguish this description of revenue and expense budgeting for a daily newspaper in the small to medium combination class. A fixed budget is recommended as suitable to the circumstances of this group of papers. The steps outlined are intended to implement the objectives of revenue planning and expense control.

FACTS, WHEN RELATED TO FUTURE PLANS, spell budget in newspaper operations. What course does management plan to follow? What profit (or loss) can it expect to find at the end of the trail? It is important that the course and results be planned before the tour begins and that they be compared with the actual results during the journey. Budgets furnish this information so that management can take appropriate, intelligent detours when necessary. However, successful budgets recognize the historical facts as merely the starting point. They go on from there as management's guide and control tool through:

Organiation—delegated authority and responsibility.
Chart of accounts—in sufficient detail, by area of responsibility.
Reports—analyses of budget variances with control follow-up.

Effective Organizational and Accounting Setup Needed

The business activities must be departmentalized along lines of delegated authority and areas of responsibility. The primary departments would include: retail advertising, classified advertising, national advertising, editorial, composing, proofreading, stereo, press, newsprint and ink, circulation and administrative. Sub-divisions may be made as a particular operation requires. For instance, the composing department may be subdivided into key-board-perforator, ad make-up, and news make-up. The administrative department may be subdivided into personnel, building services, and business office.

As a second preliminary, the chart of accounts must be designed to meet the particular operation's needs. The "Standard Chart of Accounts for Newspapers" published by the Institute of Newspaper Controllers and Finance Officers in 1951 is invaluable in designing a proper classification of accounts which

will later facilitate comparison of departmental costs with other newspapers. To illustrate, the account classification in the retail advertising department might include salaries, bonus, auto expense, lunches and entertainment, travel expense, sales promotion, mat service, supplies and materials, postage, telephone and telegraph, and miscellaneous.

The Task in Perspective

It must be kept in mind throughout the following description of budget preparation that control stems not from the budget itself but from its analysis in comparison with actual results. Variances from budget need constant study. The budget will guide and control only so well as the accountant intelligently interprets variances and reports them simply to operating management. The form and scope of these reports depend upon the ingenuity of the accountant and the temper of mind of the executive responsible for their use. Examples of such reports are indicated in the several steps of budget building which follow.

Preparation of the budget should begin about October 15 (after nine months' expenses of the current year are available), with completion and final adoption not later than December 31. Assuming operations are on a calendar year basis, the current year's budget will then be in the hands of the operating executives for control purposes starting January 1. Except for the larger metropolitan newspapers, production volumes are relatively constant. Changes in circulation and advertising volumes from week to week do not permit fluctuating staffing or manning. With minimum but adequate (and constant) staffing, peak production periods are absorbed through overtime. Valleys are offset by scheduled vacations. Therefore, newspaper revenues and expences can be budgeted for the full year. In this way, the adopted budget will be fixed through the 12 month period. Detailed analyses of variances will explain actual deviations from budget and guide management in correctional decisions.

Budgeting and Reporting on Advertising Revenues

Newspaper advertising revenues fall into three major categories. These are retail (retail store outlets), classified (by classification in the classified pages), and national (primarily manufacturers). A different sales approach is necessary to properly serve each of these three types of newspaper advertisers. Hence, there are separate departments with a departmental manager responsible for each.

Consider the steps necessary in building the retail advertising revenue budget. At hand will be:

1. A record of each day's linage for the past 12 month period.
2. A calendar of all special promotions during the same period and the linage obtained from each promotional effort.
3. A calendar of all special promotions planned during the budget year.

With this information available, linage obtained from special promotions (item 2 above) will be deducted from the particular day's actual linage (item 1 above) to arrive at the regular day-to-day linage. Building the budgeted linage begins at this point.

The sales potential of day-to-day advertising depends upon several factors. Is the community experiencing growth or decline? Have new retail stores or outlets moved into the area? How does the trend in retail linage in the particular newspaper compare with the trend of all retail linage throughout the country? What is the business barometer? These are judgment areas, based on trends and the economic outlook. These factors, weighed by management, will develop the attainable goal. For illustrative purposes, it is assumed below that the sales potential of day-to-day retail advertising linage in the budget year is 102 per cent of the day-to-day linage obtained in the past 12 month period.

The next step considers the linage to be obtained from special promotions (item 3 above) planned for the budget year. Seasoned judgment will be applied to last year's promotions which are to be repeated and linage estimates obtained. Last year's linage on nonrepeating promotions will be dropped. Estimated linage from new promotions will be added.

In building the linage budget, a particular day of the week will be compared with the same day of the week of the previous period. Friday, January 1, 1954 will be based on Friday, January 2, 1953 and not on Thursday, January 1, 1953. This is due to the fact that the day-to-day retail advertising volumes vary considerably from one day to another within the week but are relatively level when comparing any one day of the week with the same day of the week in another year.

Retail advertising linage budgeting can best be illustrated by assuming that the "New Year's greeting" promotion potential is 4,500 lines (up 500 lines from the 4,000 on January 1, 1953 due to better sales coverage) that the January 5 "sales day" promotion goal is 2,000 lines greater since the formation of the Retail Merchants Sales Day Committee and that new "insurance week" promotion is planned for January 13 to obtain 2,500 lines. The retail advertising linage budget would be developed as follows:

JANUARY In 1953	JANUARY In 1954	Day	THE ACTUAL FOR 1953 Total linage	Promotion linage	Day-to-day linage	THE BUDGET FOR 1954 Day-to-day linage	Promotion linage	Total linage
2	1	Friday	16,000		16,000	16,320	4,500	20,820
3	2	Saturday	15,000		15,000	15,300		15,300
5	4	Monday	20,000		20,000	20,400		20,400
6	5	Tuesday	28,000	7,000	21,000	21,420	9,000	30,420
7	6	Wednesday	25,000		25,000	25,500		25,500
8	7	Thursday	45,000		45,000	45,900		45,900
9	8	Friday	19,000		19,000	19,380		19,380
10	9	Saturday	14,000		14,000	14,280		14,280
12	11	Monday	21,000		21,000	21,420		21,420
13	12	Tuesday	23,000		23,000	23,460		23,460
14	13	Wednesday	19,000		19,000	19,380	2,500	21,880
		(and so on to January 31, and similarly for each month of the year.)						
			245,000	7,000	238,000	242,760	16,000	258,760

Thus, a retail advertising linage budget is developed for each day of the year. The purpose in building daily linage budgets is to measure daily volume performance. Operating management now has before it the daily volume potential. As the retail advertising copy is scheduled for daily production, it knows how well its units of sale compare with the budget. Unfavorable comparisons are daily alerts to trouble, thereby affording immediate opportunity for analysis by advertisers and by sales territories. Management has the facts promptly and can plan additional sales effort or other corrective action.

Nothing has so far been said about dollar revenues. These fall in line automatically if the units of sale are as planned. Where rate changes have been effected during the past year or are planned for the budget year, revenue comparisons are misleading. The measurement must be in units of sale. If the budgeted linage is actually obtained, the revenues to be derived will take care of themselves. Therefore, the retail advertising revenue budget is merely an extension of each month's (not daily) budgeted linage volume at the current average revenue rate per line, with anticipation of contemplated rate changes.

Both classified and national revenue sources are very sensitive to the economic climate. The situation in help-wanted or used cars will affect classified linage. A buyers' market or a sellers' market materially affects the national linage.

The budgeting procedure for classified and national advertising is substantially the same as for retail linage. Linage from these two sources of advertising does not ordinarily fluctuate materially from day-to-day within a calendar week. Therefore, preparation of these linage budgets on a weekly basis (rather than daily as for retail) will eliminate detail and afford adequate measurement.

Daily linage reports guide management to its revenue goals. Simply, the daily reports summarize results, with pertinent explanatory footnotes on major deviations from budget, as follows:

DAILY ADVERTISING LINAGE REPORT

	TODAY			MONTH TO DATE		
January 13	Budget	Actual	Over (Under)	Budget	Actual	Over (Under)
Retail	21,880	20,500	(1,380)*	258,660	259,000	240
National	10,000	10,500	500	70,000	71,500	1,500
Classified	15,000	14,800	(200)	120,000	122,000	2,000
TOTALS	46,880	45,800	1,080	448,760	452,500	3,740

* Insurance Section budgeted 2,500 lines; deferred one week.

Summary results on total daily linage are also important sales guides. Detailed results by sales territory and by advertiser are equally important. This information may be reported monthly, as follows:

RETAIL SALESMAN A ADVERTISER	1954 LINAGE	1953 LINAGE	GAIN OR (LOSS)
Miller & Jones	5,390	4,564	826
Golden Dairy	644	168	476
Beer Radio Service	1,267	2,359	(1,092)

A similar report by sales territory keeps the finger on the pulse of classified advertising linage obtained from contract advertisers.

Monthly reports on national linage guide management toward its budget goal. These reports are prepared by appropriate product grouping, as follows:

ADVERTISER	BRAND NAME	1954 LINAGE	1953 LINAGE	GAIN OR (LOSS)
Beers				
Fort Pitt Brewing Co.	Fort Pitt	1,966	—	1,966
P. Ballantine & Sons	Ballantine	1,176	3,536	(2,360)
Gasoline & Oils				
Gulf Oil Corp.	Gulf	5,236	4,720	516
Groceries				
Standard Brands	Chase & Sanborn	696	600	96
General Foods Corp.	Swans Down	2,000	—	2,000

Budgeting Circulation Revenues

Generally, circulation revenues fall into the following classifications: city subscribers, dealers and agents, mail subscribers, and street and counter sales. For each of these classifications (with further sub-divisions as desired), the budget procedure is substantially the same. Copies sold do not fluctuate materially from day to day, except in the metropolitan newspapers. Therefore, budgets can be built on average daily circulation for the month, i.e., total copies sold divided by publication days in the particular month. Average daily circulation for each revenue group should be available for each month of several previous years. At this point, area population trends are related to management's

circulation promotion plans. Experienced judgment is applied to both to project the average daily circulation to be obtained in the budget year. The illustration anticipates a five per cent growth trend in 1954:

City Subscribers	AVERAGE DAILY CIRCULATION 1952 Actual	1953 Actual	1954 Budget	Daily revenue @ 5¢ each	Publication days	Monthly revenue budget
January	33,700	34,800	36,540	$1,827	26	$47,502
February	33,600	35,300	37,065	1,853	24	44,472
March	33,500	35,500	37,275	1,864	27	50,328
April	33,400	35,700	37,485	1,874	26	48,724
May	33,400	35,600	37,380	1,869	26	48,594
June	33,300	35,500	37,275	1,864	26	48,464
July	33,200	35,400	37,170	1,858	27	50,166
August	33,100	35,400	37,170	1,858	26	48,308
September	33,700	35,600	37,380	1,869	26	48,594
October	34,000	35,800**	37,590	1,879	26	48,854
November	34,200	36,000**	37,800	1,890	25*	47,250
December	24,500	26,300**	38,115	1,906	26*	49,556

* Thanksgiving and Christmas not publication days.
** Estimated for last 3 months of 1953.

Revenue budgets for the other circulation classifications are developed in the same manner. Of course, varying growth potentials and copy prices will be applied as judgment and billing practices require.

Principal Expense Categories

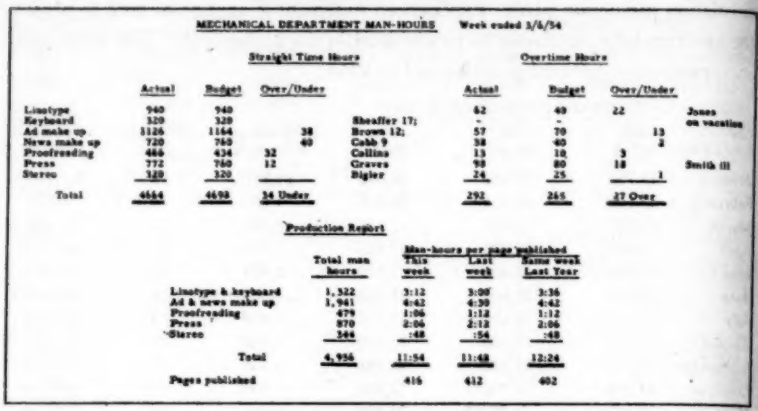
Many newspapers throughout the country cooperate in the annual "Cost and Revenue Study" of the Inland Daily Press Association. For the year 1953, newspapers having a daily circulation of between 65,000 and 80,000 copies, found a composite of their total costs falling in the following major categories:

Payroll	47%
Newsprint	26%
All other expenses	27%

While these costs are budgeted according to departmental responsibility, in the aggregate they stress the importance of cost control in all three of these major expense categories.

The Payroll Budget

With payroll comprising 47% of total costs (in newspapers of 65/80,000 daily circulation), it is important that major emphasis on budgetary control be placed here. To budget payroll costs, it is important that there be appropriate job classifications, wage and salary schedules, and rate ranges with a



MECHANICAL DEPARTMENT MAN-HOURS Week ended 3/6/54

	Straight Time Hours				Overtime Hours			
	Actual	Budget	Over/Under		Actual	Budget	Over/Under	
Linotype	940	940		Sheaffer 17;	-	49	22	Jones on vacation
Keyboard	320	320		Brown 12;	57	70	13	
Ad make up	1126	1164	38	Cobb 9	38	40	2	
News make up	720	760	40	Collins	13	10	3	
Proofreading	466	434	32	Graves	98	80	18	Smith ill
Press	772	760	12	Bigler	24	25	1	
Stereo	320	320						
Total	4644	4698	34 Under		292	265	27 Over	

Production Report

	Total man hours	Man-hours per page published: This week	Last week	Same week Last Year
Linotype & keyboard	1,322	3:12	3:09	3:36
Ad & news make up	1,961	4:42	4:30	4:42
Proofreading	479	1:06	1:12	1:12
Press	870	2:06	2:12	2:06
Stereo	344	:48	:54	:48
Total	4,956	11:54	11:48	12:24
Pages published		416	412	402

EXHIBIT 1

clearly defined scale of increases for recognition of merit and length-of-service. In establishing the monthly straight-time payroll expense budget, the personnel included in each departmental expense classification is set up individually at the straight-time rate to be effective on January 1. Appropriate increases are budgeted in the amounts and at the times throughout the year that wage and salary schedules (or management's periodic payroll review) indicate. If departmental staff changes are contemplated, appropriate monthly budget changes are reflected.

Building the retail advertising salary budget for each month of the year may be illustated as follows:

EMPLOYEE	SALARY JAN. 1	JAN.	FEB.	MAR.	APRIL	
A	800					
B	425		50			
C	450				40	(and so on to
D	250			50		December 31)
E	375				25	
	2,300					
The Budget						
Salary Increases			50	100	165	
Base salary		2,300	2,300	2,300	2,300	
Staff changes				175	350	
Monthly budget		2,300	2,350	2,575	2,815	

Detailed comparison of actual with budget permits monthly analysis, by each account classification, to show variances from budget as follows:

RETAIL ADVERTISING SALARIES

March 1954	Budget	Actual	Over (Under)	
Salary increases	100	140	40	C increase accelerated
Base salary	2,300	2,200	(100)	A replaced at $700
Staff changes	175	350	175	Started 3/1; budgeted 3/16
	2,575	2,690	115	

Production payroll expense budgets are prepared and analyzed in the same way. Control can best be exercised here in terms of units (hours), the dollars taking care of themselves. Weekly man-hour reports, similar to the report shown as Exhibit 1, will aid materially in controlling production payroll costs. Especially important is the relation of man-hours to the number of published pages. Trends in this direction can readily be supplied to management in graph form, comparing departmental man-hours per published page with previous years. Overtime premium is ordinarily due to seasonal volume peaks, illness and vacations. These costs are less easily budgeted and are largely based on prior years' experience modified by recent staff changes.

Newsprint and Ink Budgets

Raw materials comprise 26 per cent of total costs for newspapers of a 65/80,-000 daily circulation size. They are thus a major item of cost. The raw materials budget may be related to the projected advertising and circulation volumes. Thus the allowance will vary from month to month in accordance with seasonal volume peaks. An illustrative determination is as follows:

Advertising content shall be 60%; news 40%.
There are 2,440 lines per page,
The budgeted advertising for January 1954 is 1,000,000 lines.
The budgeted circulation for January 1954 is 75,000 copies.

Consumption determination	Pounds
1. The 1,000,000 advertising lines (60%) will require 666,666 news lines (40%). With 2,440 lines per page, each subscriber will receive 683 pages of newsprint during January 1954.	
2. 75,000 subscribers, each receiving 683 pages, will receive 51,225,000 pages. While the pages obtained from a pound of newsprint will vary depending upon the page size, it is assumed here that a pound will produce 80 pages. Therefore subscribers will receive 640,312.	
3. Assuming 500 daily copies are budgeted for "returns" (unsold by agents and dealers), additional pounds of newsprint will be consumed in January	4,268
	644,580
4. Allowance for newsprint waste at 2%	12,890
	657,470
5. The budget for January at $130 per ton or 6½¢ per pound will be	$42,735

In controlling newsprint waste, it is of primary importance that the rolls be received in good condition (cylindrical in form) or immediately rejected and a claim entered with the common carrier. Having properly received, stored and delivered the newsprint rolls to the press, control then centers on pressroom waste and paper returns. Pressroom waste cannot be eliminated but it can be controlled. A daily pressroom report will indicate the pounds of newsprint damaged in transit, waste in the pressroom, paper left on cores, and copies spoiled in printing. It will also compare starting press time on the various editions with scheduled deadlines, explaining reasons for late starts. Some questions may be asked. Did pressroom temperatures tend to cause tears and consequent waste of time and materials? Were deadlines violated, causing haste and unnecessary high-speed operation of the press?

Unsold copies returned by dealers, agents and the street boy manager need constant surveillance to permit adequate but not excessive "draws." An excessive number of returned papers constitutes waste as surely as though caused in the pressroom. At 6½¢ per pound of "white paper," control of unsold copies is important. Analysis indicates which agent or dealer has excessive returns and permits prompt reduction in "draw."

Using the same assumptions as for the newsprint budget, we find:

1.	The subscribers will receive	51,225,000 pages
2.	The 500 "returns" will account for	341,500 "
3.	Assuming experience indicates 4,900 pages are printed per pound of ink; then the consumption for January 1954 will be	51,566,500 " 10,525 pounds
4.	The budget for January at $.06 per pound will be	$630.

Ink consumption is best controlled by the use of metered tanks and comparative statistics showing the number of printed pages per pound of ink. The performance or "mileage" obtained per pound of ink consumed, when compared with like figures of previous periods, is an important guide. Substantial variations require analysis.

Budgeting of All Other Expenses

In the size-range of newspaper being considered, these "other expenses" comprise 27 per cent of total newspaper costs. Their variety is legion and detailed analysis of all departmental expense classifications is essential to control. For example, the editorial department will be comprised of such account classifications as:

Salaries	Services—Wirephoto	Travel
Correspondents' space	Features purchased	Telephone and telegraph
Correspondents' expenses	News broadcasts	Photo supplies
Services—News	Engravings	Promotion
	Miscellaneous	

The budget operation requires analysis of most of these accounts. For instance, the miscellaneous account will be comprised of a variety of items. To control, one needs to know what items and the cost of each.

Preparation of the 1954 editorial miscellaneous budget begins with the expense analyses shown as Exhibit 2. Detailed actual expenses are available for nine months of 1953. The monthly budget allowance for 1953 and the average monthly actual costs for 1952 and 1951 are also indicated. The 1954 budget will be established in cooperation with the department executive and might develop as follows:

	BUDGET		
	1953	1954	REMARKS
Stationery and printing	12	12	
Postage	13	13	
Dues and fees	20	12	ANPA membership dropped
Library supplies	175	28	Revamping is nonrecurring
Plane rentals	5	5	
Miscellaneous	75	40	Seminar fees are nonrecurring
	300	110	

Expense control is exercised during 1954 through monthly analysis of the miscellaneous account and a monthly review of the actual expenses versus the budget allowance, with the executive responsible for their control.

Services of the Budget

Having projected the monthly revenues and expenses by account classification, it is necessary to summarize and develop departmental responsibility for these same revenues and expenses, month by month and in total for the year. At the start of the year, management has before it a projected profit (or loss) to be realized each month of the year and, in the aggregate, for the year. If unsatisfactory, plans can be revised before the fact rather than worried about later.

After the budget has been accepted by the department executive and, in its entirety, by top management, monthly operating reports will compare actual revenues and costs with budget, by departmental account classification for the month and year to date. These monthly operating reports are augmented by such analyses and control reports as have been outlined here.

EDITORIAL MISCELLANEOUS 1953 Expense Analysis

	1953 Total	Stationery & printing	Postage	Dues & fees	Library supplies	Plane rentals	Miscel.
January	213	1	7	44	3	15	143
February	51	8	14	-	8	-	21
March	321	6	13	38	223	15	26
April	1,667	8	10	31	1,570	-	48
May	845	-	13	35	362	-	435
June	300	7	15	5	228	-	45
July	20	1	13	-	-	-	6
August	120	25	11	32	-	-	52
September	99	27	13	-	28	12	19
Monthly Average:							
Actual - 9 mos. '53	404	9	12	20	269	5	89
Budget-1953	300	12	13	20	175	5	75
Actual-1952	177	12	12	18	20	3	112
Actual-1951	201	24	13	17	18	5	124

Dues & fees include:

Amer. News. Pub. Assn.	95
Chamber of Commerce	50
Amer. Soc. News. Editors	35
Pa. Soc. of News. Editors	5
	185

Miscellaneous includes:

Seminar fees	420
Subscriptions	108
News pencils	97
Binding papers	33
Paste	28
Timing device for AP mach.	27
Temp. recording charts	23
Calendar pads & scotch tape	21
Repair dark room sink	15
Photos	13
Typewriter stand	10
	795

Library supplies include:

Revamping		
Filing cases & supplies	742	
Outside services	825	
Repair & rebind old volumes	324	
Microfilm supplies	88	
Binders and index tabs	70	
Catalog envelopes	68	
Reference slips and file cards	29	
		2,146
Regular		
Repair & rebind volumes	88	
Envelopes & out cards	80	
City directory	60	
Facts on file subscription	28	
Misc. pamphlets	20	
		276
		2,422

EXHIBIT 2

The challenge to the newspaper accounting officer is to chart the course, to study and analyze variances, reporting them promptly, simply and effectively to management. Without this follow-through, much of the time spent on budgets is wasted and the benefits budgets afford are diluted. Auxiliary benefits of budgets should include stimulation of supervisory personnel to think, to entertain new ideas, to be a progressive management.

Budgets define management's objectives and goals. They then indicate deviations from the course so that prompt corrective action can be taken. Today's high cost of newspaper operations, vulnerable with high volume and relatively fixed payroll and raw material costs, requires the kind of detailed information which a budget provides. It is management's pulse in newspaper operations.

A Refresher on Physical Inventory-Taking

by GENE H. KLINE

General Accountant, Carton and Container Division, General Foods Corporation, Battle Creek, Mich.

What seems elementary about conduct of a physical inventory may suddenly get complicated on the count floor when the time to correct the situation is distinctly lacking. The present article highlights areas of possible confusion, recommends that preliminary instruction be adequate and wide-circulated, and describes organization for and execution of the count.

IF TIME WERE NOT IMPORTANT, most of the headaches of inventory work could be eliminated. If discrepancies show up in the figures, they could all be investigated and corrected. A firm which shuts down for a number of days at inventory makes a certain amount of time for these purposes, as there will be no movement of stock until a second check is made. But what of the firm which does not shut down for more than a weekend or which cannot spare more than one day of the regular work week for inventory? Speed cannot be emphasized at the expense of accuracy, so the problem boils down to the use of a system which will stand up yet can be carried out in a single day. Analysis of the figures must remain a separate problem. For the purpose of developing the physical inventory system, the only concern is that those figures be foolproof when placed in the accountant's hand at the end of the inventory day.

The system about to be described has been used by the author in a variety of businesses including paper converting, farm equipment sales and service, shoe polish manufacturing, and radio and television manufacturing. With slight alterations, it can be adapted to almost any type of operation. Later in this manuscript, the means by which counting accuracy is obtained will become apparent. First, however, careful and complete preparations for the big day must be considered. This should be started many weeks in advance.

Pitfalls in What and How to Count

It may seem trite to state that the first step in preparation is complete knowledge of what is to be counted and where it is to be counted, but, many times, the accountant's thinking on this subject is not completely relayed to the men who actually do the physically work. Our first step, therefore, is to draw easily-understood diagrams of the various floor areas, and to have copies of these made for distribution to all personnel involved. Too often only a few leaders have

INVENTORY COUNT TAG

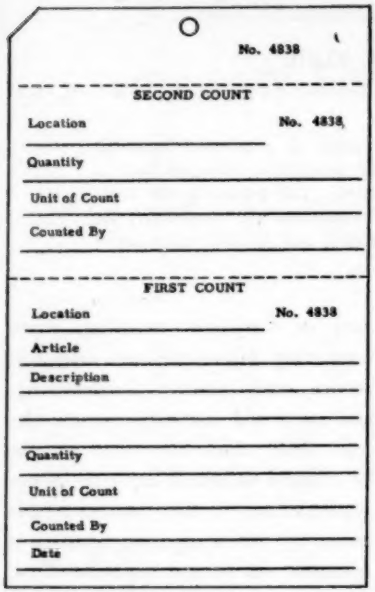


EXHIBIT 1

such material in their possession. It is of greatest significance to make everyone feel his part is important enough to be carefully outlined (and this is included).

The same thinking applies to a list of items to be counted. It is easy to tell a man causally that all scrapped and spoiled material is to be included. This indefinite instruction will leave vague impressions in his mind which show up on inventory day. Instead, each man should have a concise list of what constitutes scrapped material. All instructions should be similarly definite. Tell the men that returnable containers, for example, include skids from Company A, drums from Company B, and cores from Companies C and D. At the same time, it is necessary to state what is not to be inventoried. This can be transmitted in a list of departments not to be covered. Where non-inventory items are likely to appear on the counting floor, they should be specifically named, leaving no doubts as to whether or not goods are included.

Carrying this descriptive list another step, the men to perform the count may be instructed as to how it is to be done. That sounds simple but is not always so. Material can be considered in pounds, gallons, yards, types, calipers, colors, company names, and a whole host of other categories. It is essential to be specific and to let it be known just how the size, type, and quantity should be recorded of each particular kind of raw material.

The Foreman's Part

Full responsibility for given inventory areas should be assigned to a foreman and an accountant. An accountant may cover the activities of more than one foreman but each foreman should report to only one accountant. If the inventory areas have no particular nomenclature, code names already mentioned may be assigned to them (these should appear on the floor diagrams). Pre-numbered inventory tags (Exhibit 1) may then be prepared, to be issued to the assigned accountants as the inventory

day gets under way. Exhibit 2 shows a chart of assigned individuals and tags, which is kept by the accountant in charge of the whole undertaking and is used when tags are issued. It is also wise to distribute copies of this list of assigned areas to all foremen and accountants. If the company is of such size that one accountant cannot personally handle all of the tag distribution and supervision, delegation of this power to area supervisors is advised. At any rate, the responsibility for tags issued and turned in should be emphasized, for accurate accounting for tags is vital.

The lists and instructions which have been described, plus an outline of specific duties for each group of people (counting teams, assigned accountants, assigned foremen, etc.) as well as general information concerning inventory day, should be distributed to all personnel involved, a number of days in advance. One specific duty of the foreman is to thoroughly discuss the situation with the counting teams after this information has been distributed. Usually these will be hourly-rated men who either work under him or near his area. Two-man teams should have one man named as chief, a man who has thorough knowledge of the area and possesses a clear handwriting.

After they have talked with the counting teams on the basis of the circulated instructions, the foremen are appropriately called to a meeting with the accounting personnel to thrash out doubts and problems. It should be possible to settle most questions at this meeting. However, if it is held three or four days in advance of the inventory, some time is thus allowed for late decisions.

First and Second Count Precautions

Now we are ready to start the actual counting procedure. Each accountant assigned to a particular area starts the inventory day with a specific number of tags in his possession. If inventory tags assigned to a specific plant area are inadequate in number, the assigned accountant or foreman must not be permitted to borrow tags from other crews but must obtain any additional tags from the office accountant in charge. The accountant is the one responsible for these tags. At the end of the inventory he must show where each was used, voided, spoiled, or returned intact! Each team receives its tags from him. Each count team covers one of the specific areas shown on the previously-prepared diagram. A tag is attached to each group of items. The first-count section is filled out and detached while the second-count and top sections are left intact and blank. The man designated as chief of the two-man crew is responsible for placing complete information on the first-count section.

The next few steps are vital in assuring accuracy. When a team finishes a first count in an area, the team

INVENTORY TAG CONTROL SCHEDULE

Prepared By, Date:

BUILDING	INVENTORY LOCATION NUMBER	ASSIGNED FOREMAN	ASSIGNED ACCOUNTANT	PRE-NUMBERED INVENTORY TAGS CHARGED OUT	NUMBER OF TAGS CHARGES OUT	TAGS RET'D SPOILED OR VOIDED	SIGNATURE OF ACCOUNTANT RECEIVING TAGS
C&C Basement	B-1	Smith	Fletcher	001-075	75		
	B-2	Black	Fletcher	076-150	75		
C&C 1st Floor	FR	Parker	Martin	151-300	150		
C&C Warehouse	W-1	Burns	Hogan	801-900	100		
No. 2 Warehouse	A-1	Mapes	Long	901-1050	150		
York (Skids & Drums)		White	Long	1051-1100	50		

EXHIBIT 2

and the foreman report to the accountant and turn in all unused tags. Filled-out stubs must account for all other tags issued. If the first crew to finish counting has some spare time at this point, it is important that they not idly discuss the inventory with other crews. While deliberate collusion may be unlikely, it is the accountant's responsibility to see that there is neither deliberate nor accidental exchanges of figures between the first-count crew and the crew which conducts the second count in the same area.

In this connection, in the interval between first and second count in a given area, the accountant should look over the area and destroy all adding machine tapes, notes, or other papers left there which might give the second crew a hint of the first crew's calculations. (A cardinal rule is that one crew never makes both counts in one area.)

When satisfied that all is clear for the second count, the accountant signals the second crew to enter the area. This crew in this case does not have tags in its possession. Any tags it used in counting its first area have already been turned in. This crew detaches the second section from tags already placed on the goods, places upon that section the count which was taken, and then returns the tag section to the accountant. If untagged goods are discovered, they are called to the attention of the accountant, who may authorize this crew to fill out both first and second figures under close supervision.

On returning to the accountant, the second-count crew and the foreman must show second-count tags to match all first-count tags. It is the accountant's responsibility to compare serial numbers and, of course, quantities. If there are slight variations between the first and second counts, the accountant is in a position to select the smaller of the two. In making the tags agree, he should merely draw a line through the quantity figure on the voided tag, and then write in the selected figure. The original figure on that tag should not be erased or obliterated. The nature of the business will determine

how closely in agreement the two counts must be. If the figure is by necessity an estimate, the accountant (and not the counting crew) should be the one to apply his company's policy to the figure selected. Necessary recounts are made by both count teams under close supervision of the area foreman and accountant.

The accountant, with matched stubs on hand, is now ready to turn in his tags and stubs to the area supervisors who, in turn, return them to the accounting office. There must be no erasures on the tags. If the accountant selects between two estimates, the unused figures, though crossed out, should still be readable. Counting crews should cross out data only if they find they have erred in the process of writing. It may also be advantageous at this point to have the accountant add certain codes to the stubs. For example, he may classify them as raw material, in process goods, stores material, finished goods, etc. A policy should be established that all codes, selected adjusted figures, etc., should appear on the first-count tag. Then, when the stubs finally reach the accounting office, only first count stubs need be tabulated.

With all stubs or unused tags satisfactorily accounted for, the counting process is complete. On the next physical inventory, different colored tags should be used on the slim chance that some used tags might still be on the floor.

It Will Make for Still Better Future Inventories

With all the stubs piled high on his desk, the chief accountant might consider the physical inventory completed. But how about carrying it one step further? The job has been planned and executed by trained accounting personnel but with close cooperation of plant people. By giving complete advance material to all men involved, they have been made to feel they are helping in a management project instead of a routine shop job. Why not carry through by writing a short note to each person, thanking him for his part in making the project a success, asking him for suggestions, and showing him how the project produced accurate results? By carefully discussing the job with all of the men in advance, you have made them feel as if they are needed. You can complete your consideration of the human element by making them feel appreciated. This has paid off in more ways than one:

1. More accurate counts.
2. Good will.
3. Makes individuals proud to be a part of an organization which recognizes a job well done.

In other words, a pat on the back for a job well done never hurt any organization.

A Cycle Inventory Taken on Punched Cards

by G. V. RUTZEN

Supervisor, Stock Ledger Section, West Allis Works, Allis-Chalmers Manufacturing Co., West Allis, Wisconsin

A cycle — or serial or instalment — annual physical inventory is taken by the machinery manufacturing plant, the current practice of which is reported in this article, approximately one-twelfth of the items being counted toward the close of the week which ends each fiscal month. Tabulating equipment is used in both preparation for the task and completion of it.

WHAT WESTERNS ARE TO THE MOVIE INDUSTRY, physical inventories are to the cost accountant. Both are apparently always with us. The processing of phyiscal inventories costs many large manufacturing firms hours of lost production time, disruption of production schedules and extra expense, making it a "triple-time" losing proposition. Nevertheless, physical inventory and accounting records must be periodically reconciled to present management with a true accounting inventory value and to properly reflect the financial results of the operations.

With this situation in mind, the works accounting department at the Allis-Chalmers Manufacturing Company, in conjunction with the production control department, developed a system of physically inventorying all purchased, supply, and manufactured stock items once per year. The physical inventory counting and reconciling is performed on a cyclical basis without loss of production time and with the aid of punched card equipment.

The need for a means of obtaining physical inventories on this basis is particularly evident at Allis-Chalmers. The company "family" is comprised of sixteen separate works located in different cities of the United States, Canada, and England. There are two major divisions, namely, the tractor division and the general machinery division. The total employee enrollment is approximately 37,000. The physical inventory system to which this article refers is that of the general machinery division at the West Allis works, often spoken of as one of the largest job shops in the country. To stop this type of production and take an annual plantwide inventory would be undesirable for the following reasons:

1. Loss of sales volume.
2. Penalties or customer dissatisfaction through failure to meet scheduled delivery dates.
3. Loss of burden absorption.

Basis of Inventory Control; Accounting Periods

The Allis-Chalmers physical and financial controls of stores materials

are carried on in separate sections of the company. The physical control of purchased raw materials, supplies, finished, and semifinished manufactured stock is vested in the production control department—material control section. It is here that the detail stores ledger records are maintained. The dollar control is the responsibility of the works accounting department—stock ledger section. Here the unit costs of each item are recorded, and inventory values are reflected in approximately 200 controlling accounts. The control accounts are grouped to facilitate taking physical inventories on a cycle basis over the year.

Current unit cost data is maintained in unit price master cards. (Top of Exhibit 1.) This master deck is used to mechanically price current requisitions, stock receipts, credit requisitions for returned materials, and parts lists for estimating purposes. This master deck is also used to price physical inventories. In this way, we are assured of positive price control, since the same document is used in every instance to price the documents affecting the inventory.

Although the yearly tax period and calendar year coincide, the interim fiscal month and calendar month do not. The week begins on Monday and extends through the following Sunday. All weekly material and labor cut-offs are processed according to this Sunday ending schedule. Each fiscal quarter is composed of thirteen weeks, including two fiscal months of four fiscal weeks and the third month, five fiscal weeks, e.g., January, four weeks; February, four weeks; and March, five weeks. The March period will not, it is evident, end on the 31st day of the month unless Sunday happens to be the actual calendar date ending of the month. The fiscal month end on Sunday does, however, lend itself very well to the taking of specific portions of physical inventories without stopping production, since the inventories are taken on the same day or days of the last fiscal week of the month (Friday, or Thursday and Friday) and, if necessitated by unusual circumstances, can be concluded by working Saturday without getting into the complications which arise when inventory-taking is extended into the next accounting period.

Cycle Inventory by Control Accounts on Prepared Punched Cards

At the inception of the cyclical physical inventory plan, physical counts of items governed by each inventory control account were taken on a biennial basis, a count being taken of approximately one twenty-fourth of the general machinery inventories each fiscal month. During the first post World War II years, however, it was decided that all material in the general machinery division stores should be counted each year. To accomplish this, an annual schedule is prepared jointly by the material control and stock

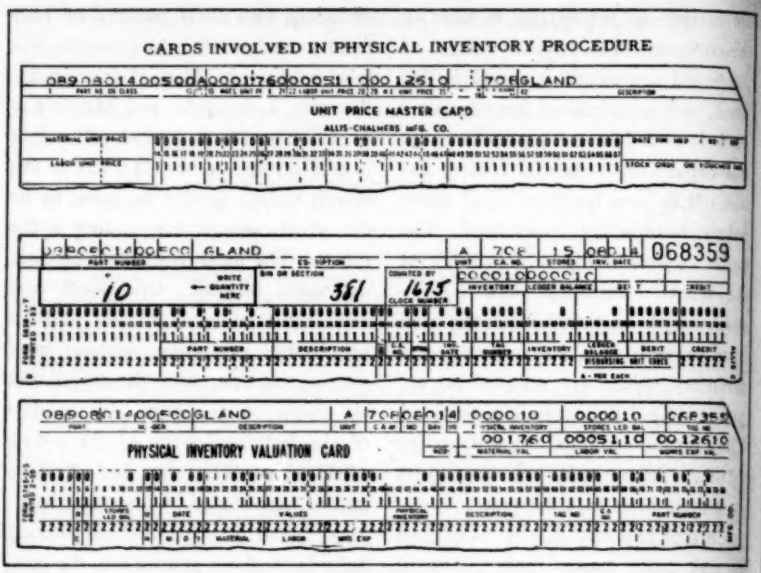


EXHIBIT 1

ledger sections showing the controlling accounts which are to be inventoried at the end of each fiscal month. To facilitate inventory control, the following points had to be kept in mind when the composition of the various controlling accounts was established and have enabled us to establish a set of controlling accounts which have proved invaluable during the past several years:

1. Items in the same control account should be similar in substance, construction, or related as to type of product.
2. Control accounts and storage locations should coincide, if possible. The Allis-Chalmers West Allis works has 54 major inventory locations.
3. The control group should not be so large as to make it difficult to inventory at the end of a fiscal month.
4. The control group should also fit into the basic structure prescribed by the inventory committee and the comptroller for reporting of inventory status to management; i.e., what value the company has in steel, copper, bearings, etc., in the event of a general increase or decrease in market value.

Comparable to the stock ledger section's unit price as has been illustrated in Exhibit 1 (top), material control records include a punched card master deck of index part cards which reflect such pertinent data as the part number, description, location, controlling account, and disbursing or carrying factor code. Just prior to the scheduled inventory date, selected data for each item in the controlling accounts chosen for inventory that month is reproduced into Inventory Tags (middle of Exhibit 1), which

ALLIS CHALMERS MFG. CO.
Form: SBM-1-7
Printed: 1-53

WORKS ACCOUNTING INVENTORY REPORT

Sheet No.:_____

DESCRIPTION	PART NUMBER	UNIT OF DISB.	PHYSICAL INVENTORY	STORES LEDGER BALANCE	LEDGER ADJUSTMENT DEBIT	LEDGER ADJUSTMENT CREDIT	CONTROL ACCOUNT NUMBER	DISBURSING UNIT CODE
BUSHING RBR	08927035000005	A	189	186	3	CR	408	
GLAND	08908014000500	A	10	10	CR	CR	708	
IMPELLER	08908059000-01	A	4	4	CR	CR	708	A - PER EACH
IMPELLER	08908059000051	A	2	2	CR	CR	708	B - PER POUND (LB.)

EXHIBIT 2

ALLIS-CHALMERS MFG. CO.
FORM 6307-2-3 PRINTED 4-53

PHYSICAL INVENTORY VALUATION REPORT

OF

CENTRIFUGAL PUMP DEPT.

ACTUAL PHYSICAL INVENTORY TAKEN AT THE CLOSING HOUR OF BUSINESS August 1, 1954

SHEET NO. 0000

J. E. DATE SEP 1954

WORKS

DESCRIPTION	PART NUMBER PROD.	DRAWING NO.	ISSUE	MARK	PHYSICAL INVENTORY	DISB UNIT	TOTAL RECEIPTS FROM UNFINISHED STOCK OR PURCHASE ORDERS RECEIVED 90 DAYS PRIOR TO INVENTORY ORDER NUMBER	QUANTITY	INVENTORY CODE	VALUE OF PHYSICAL INVENTORY MATERIAL	LABOR	WORKS EXPENSE	TAG NO.
BUSHING RBR	89270	35	00	005	189	A			708	11407			68358
GLAND	89080	14	00	500	10	A			708	1760	5110	12610	68359
IMPELLER	89080	59	00	001	4	A			708	39540	16640	34952	68360

EXHIBIT 3

are distributed to the various locations where the inventory is to be taken. A tabulated listing is prepared from the tags. It reflects all data, including the tag number, and provides a list of each item to be counted.

The actual counting of items is performed on the last working day or two of the fiscal month. All movement of materials to be inventoried is kept at a minimum during this period.

Whenever it is necessary to remove or add to an item that has already been counted, the tag is altered by the storekeeper and rechecked by an inventory checker. After every item has been counted and after the count has been verified by the checkers, the inventory tag is picked up and returned to the material control office. The tags are checked on punched card equipment to make certain that all have been returned and are key punched for quantity. The tags are then given to the material control inventory group for individual reconciliation with the stores ledger record cards. Differences remaining after investigation are then reflected on the stores ledger cards.

Summarization and Adjustment of Inventory

Necessary information from the inventory tags is then mechanically reproduced into the Physical Inventory Valuation Card (bottom of Exhibit 1), and from the inventory tag Inventory Report (Exhibit 2) is prepared for the production control management, showing required adjustment to stores, a duplicate copy of which is also forwarded with the inventory valuation cards, acting as a transmittal or "check-off" copy, to the Stock Ledger Section.

Next, the values as of the inventory date, are mechanically calculated and punched into the physical inventory valuation cards, the work performed by the electronic calculator through the use of key punched unit price master cards (Exhibit 1).

In order to provide helpful information about open orders, punched cards indicating such open orders are collated with the physical inventory valuation cards and the Physical Inventory Valuation Report (Exhibit 3) is prepared by the tabulating department and forwarded to the accounting department. In the accounting department, all open orders as reflected on

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MATERIAL DISBURSING FACTOR CODES (see page 278)

A—Per Each	H—Per Ton	P—Per Gram
B—Per Pound (lb.)	I—Per Roll	Q—Per Quart
C—Per Ounce (oz.)	J—Per Lineal Inch	R—Per Lineal Yard
D—Per Lineal Foot	K—Per Sheet	S—Per Square Inch
E—Per Square Foot	L—Per CWT (100#)	T—Per Cubic Foot
F—Per Board Foot	M—Per Pair	V—Pet Set
G—Per Gallon	N—Per Pint	W—Per Troy Ounce

Inventory must be reported in accordance with these codes so both manufacturing department and (cost), works accounting-stock ledger section, coincide for correct pricing.

the tabulated listing are checked for proper handling and the ledger account is adjusted for the following:

1. Receipts of material prior to inventory but invoiced to the company after inventory, or the value of partial recipts on company manufactured stock orders debited to the account at a subsequent date.
2. Disbursements of material prior to inventory but the documents received subsequent to inventory date.
3. Material in transit at inventory date for which the applicable invoices have been posted to the controlling account prior to inventory date.

The adjusted ledger balance is compared with the tabulated physical inventory valuation. The difference resulting is the net adjustment to the inventory account.

No Stopping of Production

At no time, does the counting of physical inventory require that production be halted. Taking physical inventories on this basis, enables both the material control and the accounting departments to do the inventory work with a small highly skilled group and thus insures a more accurate inventory.

A Year End Inventory Processed on Punched Cards

by ROBERT H. GERNES

Assistant Works Auditor, John Deere Des Moines (Iowa) Works

This narrative of the processing of annual physical inventory in a manufacturing plant features the use of tabulating equipment for its summarizing with stress on advance preparation. Mark-sensing of quantities is used to transcribe tag quantities to cards and to prepare the latter for automatic extensions. The inventory in question is maintained on a "lifo" basis, requiring procedures to group the items in pool classifications.

WE HAVE GREATLY REDUCED detailed inventory work through the use of punched card accounting machine procedures. This system has been worked out for each of the company factories and facilitates not only the factory inventory but the consolidation of the various inventories as required under the "lifo" system in effect. Some of the John Deere factories use their own accounting machine instalation, while others not having such an instalation forward the inventory work to the central cost department where it is processed. In prior years the compilation has been satisfactorily performed through the use of business machine services. My purpose here is to describe its application at the factory level.

The Inventory Item Cards

Several weeks prior to the taking of a physical inventory, the central cost department sends to the factory prepunched Inventory Cards (Exhibit

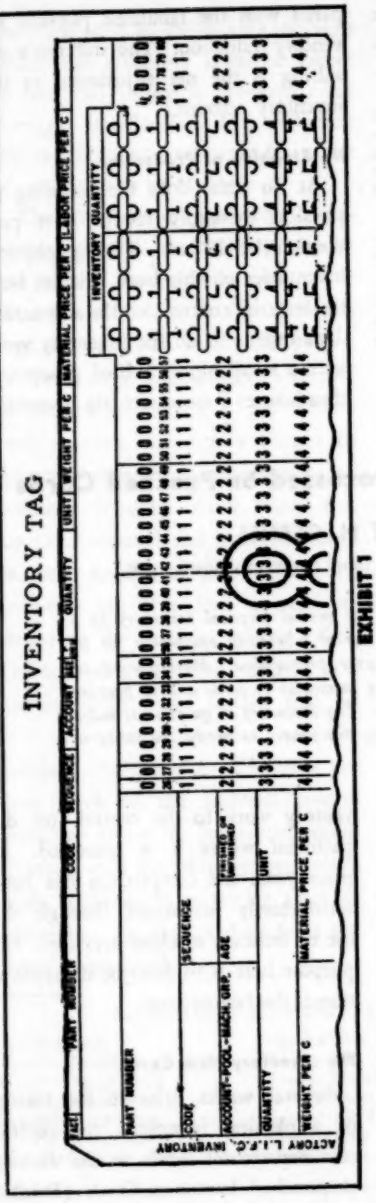


EXHIBIT 1

1). These consist of separate groupings into the three main classifications of inventory. Each of these three types of cards is marked by a colored stripe to help in keeping the classifications segregated. Thus, the raw material cards may carry a brown stripe, work-in-process a grey stripe and the finished goods a red stripe, the colors being changed each year. The following information is punched into each card and imprinted across the top: factory code number, part number, unit (as carried in cost records), and current inventory value.

In addition, the raw materials cards show the productive code number as carried on the central cost department records, the raw materials account number and the "lifo" price. (As this discussion is intended to be limited to inventory methods, it is believed sufficient to explain the productive code number by stating that all productive materials are coded by the purchasing department as a means of assisting the central cost department in cost finding.) The work-in-process cards carry the pool designation, necessary in compiling the "lifo" inventory, and the labor price as shown in the central cost department records. By pool designation is meant the classification of the inventory into basic groups, such as raw steel, rubber tires and tubes, lumber, purchased mechanical parts, etc. The finished goods cards carry the labor price and the age as shown in the inventory of the previous

year. We designate inventory age alphabetically, as "A"—current year, "B"—two years old, "C"—three years old, etc.

A primary advantage of using punched cards is that much of the time-consuming work can be performed in advance of the actual taking of the inventory. As all of the pertinent information pertaining to any item is to be transcribed onto a punched card, the importance of getting as much as possible on the card in advance is evident.

Classification and Age Data Placed on the Cards

To meet our requirements, the following information is thus transcribed in advance:

1. Classification of finished goods by implement line number.
2. Classification of work in progress by pool designation.
3. Aging of raw materials, work-in-process and finished goods.

We consider it necessary to segregate the finished goods by type of product. Thus, for accounting purposes, we divide our manufactured products into seven principal lines or types:

1. 100-series corn pickers and attachments.
2. 200-series corn pickers and attachments.
3. Tractor cultivators, tool bars and attachments.
4. Parts for pickers and cultivators.
5. Shovels and sweeps.
6. Sulky rakes.
7. Cotton pickers.

The sales department is better able to classify finished goods by type or line than any other plant department. The punched cards are sent to that department and the line number is written directly on the card or the information required is furnished to the accounting department to be transcribed onto the cards.

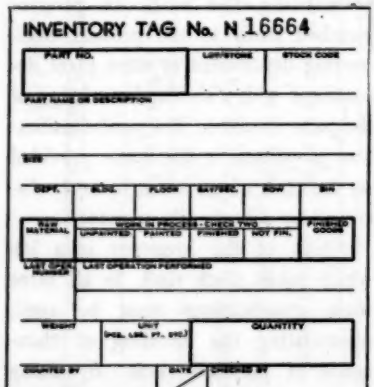
Our raw materials accounts are set up in such a way that the various types of material are segregated by account, thus the classification of raw materials inventory by pools, as required under the "lifo" system, is an easy process. The finished goods inventory is classified into pools on a percentage basis furnished by the cost department. We believe that such grouping into "lifo" pools can best be accomplished by forwarding the work-in-process punched cards to the product engineering department or some plant department with a similar knowledge of the parts involved. The pool classification is written in the space provided on the card, where it can be easily discerned by a keypunch operator.

Aging of the inventory is a job which takes much time, as all three main classifications must be aged, necessitating the handling of thousands of punched cards. By doing the aging in advance, a major amount of detailed work is accomplished ahead of time.

According to the regulations governing a "lifo" inventory, once an item is declared obsolete, it cannot be picked up again on a current basis.

The accounting department maintains a complete file on obsolete items and checks the punched cards against this file to determine which cards are to be marked obsolete. This is done with all three of the main classifications of inventory, raw materials, work-in-process and finished goods. After the cards have been checked for obsolescence, the current aging is accomplished as follows:

1. Raw materials
   A. Send the punched cards to the plant purchasing department and have all material purchased during the current year identified by writing "A" in the space provided on the card.
   B. Those cards not marked as "A" or obsolete, are checked to the inventory of the prior year and aged in accordance with the policy of the factory.


INVENTORY TAG No. N 16664

PART NO. | LOT/STONE | STOCK CODE

PART NAME OR DESCRIPTION

BIN

DEPT. | BLDG. | FLOOR | BAY/SEC. | ROW | BIN

RAW MATERIAL | WORK IN PROCESS - CHECK TWO: UNPAINTED, PAINTED, FINISHED, NOT FIN. | FINISHED GOODS

LAST OPER. NUMBER | LAST OPERATION PERFORMED

WEIGHT | UNIT (PCS., LBS., FT., ETC.) | QUANTITY

COUNTED BY | DATE | CHECKED BY

DO NOT WRITE BELOW — FOR OFFICE USE ONLY

YEAR INTO	RAW MATERIAL	ACCOUNT NO.	MATERIAL COST PER 100	
CURRENT	WORK IN PROCESS	ACCOUNT NO.	MAT. COST PER 100	LAB. COST/100
OBSOLETE	FINISHED GOODS	ACCOUNT NO.	TOTAL W.I.P. COST PER 100	
LIFO POOL	PRICES	EXT. ON MAT.	EXT. ON PUR.	EXT. ON PUR. LESS 2%

1953

EXHIBIT 2

2. Work-in-Process
   A. Send the punched cards to the plant production control department and have all material processed during the current year identified by writing "A" in the space provided on the card.
   B. Those cards not marked as "A" or obsolete are checked to the inventory of the prior year and aged in accordance with the policy of the factory.
3. Finished goods
   A. Send the punched cards to the plant sales department which maintains a complete record of goods warehoused. Those items produced during the current year are identified by writing "A" in the space provided on the card.
   B. Those cards not marked as "A" or obsolete are checked to the inventory of the prior year and aged in accordance with the policy of the factory.

It should be noted here that, if a punched card has been marked as obsolete, such marking is not changed, even though that item has been purchased, processed or warehoused during the current year.

Matching Count Tags to Punched Cards

Once the count has been made, the problem is to get the information accurately transcribed onto the punched cards in the fastest possible manner. We use a triplicate form Inventory Tag (Exhibit 2). The original copy is sent to the accounting department, the duplicate copy is sent to the production control department and the triplicate (pasteboard) copy is attached to the material inventoried. (Prior to the taking of the inventory, written instructions have been issued to all supervisory employees, describing in detail the use of the inventory

tags and all pertinent information as to procedures to be used.)

After the inventory tags have been checked back into the accounting department, they are sorted by part number within each of the three main inventory classifications. Tags covering the same part or stock are stapled together with an adding machine tape listing the quantity on each tag and the total of the group of tags. One person in the accounting department is charged with the responsibility for each part or section of the inventory and follows the procedure given below:

1. Pull the punched cards to match the inventory tags.
2. Make up hand-written machine cards for those tags for which no prepunched cards were provided.
3. Issue matched sets of machine cards and inventory tags to be mark sensed. (It is better to issue these in small sets of 125 to 150 cards in order to facilitate checking back the mark sensing.)

Item 2, above, may prove to be a bottleneck in the inventory procedure. Usually those items for which no prepunched cards have been furnished are either old items for which costs are difficult to obtain or new items for which costs have not been established. We have found, that if one or more persons familiar with the cost records and procedures is assigned the duty of making up the hand-written cards, this phase progresses much faster. It is important that all hand-written cards include the same information as the prepunched cards, such data depending upon the classification of inventory in which the items are to be included.

Mark-Sensing Quantities on the Cards

The inventory quantities are now to be transcribed onto the punched cards and hand-written cards. This is done by the procedure known as mark-sensing. When we first started using the punched card system, the accounting department employees were not familiar with punched card methods, so we thought it advisable to have a representative from the machine accounting service used for the inventory to instruct them in the proper method of performing this job. In addition, simple written instructions were provided. Each year these instructions are reviewed and used as the basis for training new employees. At first, the mark-sensing seemed to be a slow, endless procedure but, as the routine was established and the personnel became familiar with the work, the advantages of the system were evident. The mark-sensing is done in the columns headed "inventory quantity" by drawing a single straight line within the outlined marking area for each figure in the quantity to be transcribed. In addition to doing the actual transcribing of quantities by mark-sensing, the persons assigned to this task act as a check on some of the prior work. Part numbers and units of measure as shown on the inventory tags are carefully checked to the prepunched cards.

Adding machine tapes showing the total quantity of the same part number, as described above, are checked back to the inventory tags.

After each group of cards has been marked, it is necessary to check the mark-sensing to establish that the right quantities have been entered on the cards. This is done by running adding machine tapes of the quantities on the inventory tags and on the marked cards. If the totals are identical, it is safe to assume that the marking is correct. If they are not identical, the tapes are checked back until the error is determined. As the personnel become more familiar with the mark-sensing procedure, very few errors in marking are made. However, we have continued checking.

Machine Compilation of the Inventory

After the accounting machine cards have been marked and balanced to the inventory tags, a certain amount of hand-sorting must be done to prepare them for the key-punch operators. As has been stated, the classification by implement lines, classification by pool numbers, and the aging of the inventory are write-in operations on our punched cards. This information must be punched into the cards, so our manual sorting is as follows:

1. Raw Material—sorted by age.
2. Work in Process—sorted by age, then subdivided into pool classification.
3. Finished Goods—sorted by implement lines, then subdivided into age classification.

This sorting process is primarily a means of saving time for the key-punch operators, for the cards can then be gang-punched according to the way in which they are sorted. Thus a large group can be punched "Age A" or "Implement Line 1" one at a time. All of the hand-written cards are sorted in the same manner as the prepunched cards and are kept segregated but packaged with the particular main classification of inventory.

Certain sections of our inventory are kept on a perpetual basis. We have eliminated writing inventory tags on these sections, substituting typewritten lists in their place.

A Record of Substantial Time-Savings

The various procedures described here have been responsible for a great reduction in our inventory work. Results are evident from the following:

1950 Inventory—Six weeks to complete. Extra help hired to work full time on inventory. Much overtime work by regular accounting department employees.

1952 Inventory—Three weeks to complete. No outside help hired. Overtime reduced to an average of 42 hours per regular accounting department employee.

1953 Inventory—Two weeks to complete. No outside help hired. Overtime reduced to an average of 30 hours per regular accounting department employee.

In view of the ever-present demands by management for facts and figures at an increasing pace, it is recommended that the punched card machine accounting method for processing an inventory be studied, and, if possible, be put into effect.

Letters to the Editor

WHAT ABOUT THE CAPITAL ON WHICH THERE'S TO BE A RETURN?

Editor, N.A.C.A. Bulletin:

IN THE RECENT LITERATURE which I have read concerning return on capital employed in a business, including "Return on Capital Employed—Measure of Management" by F. J. Muth, in the February 1954 issue of the *N.A.C.A. Bulletin*, all of the writers seem to base their comments on one or more of the following assumptions:

1. That the amount of capital available to a business is controlled by the management of that business.
2. That management can improve the return on capital employed in the business at will, by decreasing the need for capital through increasing the turnover in accounts receivable or by reducing inventories.
3. That the capital invested in a business is a commodity readily available to the business venture in need of that commodity and also that it is a commodity which can readily be disposed of when the need no longer exists.
4. That the amount of capital in a given business at any given time is the correct amount of capital for that business or, at least, that it is the amount of capital which management wants in order to operate the business.

As a practical matter it should be recognized that these assumptions are not valid general principles and that it is only in exceptional cases that such conditions actually prevail. Of course, it is true that management increases or decreases the capital by creating profits or suffering losses and that a board of directors can increase capital through borrowings or other methods and that they can decrease capital by payment of dividends. Perhaps that is the general rule, but there are a great many instances in which the stockholders control both the amount of capital to be put in and the amount of capital to be taken out of the business, often without deference to management's wishes.

Management does have the responsibility for using the available capital to the best advantage, but it cannot increase the dollars of profit earned nor can it improve the return on invested capital merely by reducing inventory or increasing the turnover in accounts receivable. Management must put that capital to productive use, either in expansion and growth of the business through the development of new products and new markets or in improved facilities to meet present demands more efficiently and at lower cost. It goes without saying that such measures are not available to every business under every circumstance.

The larger, well-managed companies, and particularly the publicly-owned companies with established earnings records (which create a ready market for their securities), can obtain capital under ordinary circumstances merely by operation of the mechanics of issuing additional capital shares. Similarly, these same companies, which are presumed to have planned their capital requirements on a sound basis, may dispose of excess capital by retiring that part of their capital structures which were created to fill temporary needs.

These conditions are not found in newer and/or smaller companies. Temporary capital may not be available because of their short term of existence or limited earnings and additional permanent capital may not be desirable because it will dilute the equity of present stockholders. In other cases, the management, which may also be the owners, may not want to subject itself and the operations of the company to the restrictions frequently imposed when capital is acquired through long-term bank arrangements. Also, these same companies

cannot or will not dispose of capital when it is no longer needed. There are several reasons for this. Specific companies may be accumulating capital (subject, of course, to the provisions of tax regulations) for future projects and, in some cases, the current position would suffer if the income were distributed in cash.

Because of the reasons why capital cannot be adjusted to suit the current needs of business and because management cannot always control the amount of capital in the business, it follows that, at any given time, the business may have either more or less capital then necessary.

The writers of the various articles may have recognized these conditions, and some have by implication, but they have failed to mention that the first step in measuring management performance based on the return on invested capital is to examine the capital structure and determine that the invested capital does afford a proper basis for measurement. If examination discloses that the invested capital is more or less than it should be, what steps are taken then? Is excess capital to be eliminated in calculating the return on investment? Of course, it does not make sense to adjust the capital structure for purposes of the calculation if we find the capital to be something less than the proper amount but, in those cases, do we merely credit management with doing a good job because of a high return on investment or do we attempt to prove that it has failed to discharge its responsibility to obtain more capital and create larger profits on an optimum amount of capital?

It seems to me that others may have some interesting thoughts on this subject and perhaps the experience of some readers may serve as illuminating examples in this absorbing subject.

ALEXANDER J. ANDRIAN, *New York Chapter*

AUTHORS OF TEXTBOOKS PLEASE NOTE!

Editor, N.A.C.A. Bulletin:

IN THE COURSE OF WORK AND STUDY in the field of industrial accounting during the last seventeen years, I have become very conscious of the limitations of accuracy in the practice of the art. Perhaps a basic education of engineering is responsible for this degree of awareness, but I am sure that the majority of cost accountants will agree with the reality of accuracy limits. However, there are many accountants who still find it difficult to accept such labor-saving practices as "penny-less" accounting and "significant-digit" reporting.

The authors of accounting texts can make a large contribution to the field of work-simplification. A number of suggestions may be offered: In the first place, the meaning of such expressions as "significant digits" and "limits of accuracy" should be thoroughly explained at some prominent location in every accounting textbook, particularly those in the field of cost accounting. My search revealed no coverage of this topic in any accounting text.

Moreover, the usual textbook creates the illusion of scientific exactitude in certain areas of accounting where nothing even approaching exactness is attainable. This is particularly true in such matters as depreciation accounting, costing issues from stores account, burden accounting, burden rate determination in text illustrations to the fourth, fifth, or more significant digits, the averaging of direct labor and material cost, and in cost statement preparation where the number of significant digits most frequently used implies an accuracy of one part in more than 100,000. Because much of the result of accounting procedures, particularly those in the field of cost accounting, is dependent upon the judgment and estimates of individuals, the error is certainly in excess

of one part in 1,000. The exactness of the arithmetic creates an illusion of accounting exactness. Writers should emphasize the limits of accuracy in each accounting process. The printed matter of texts is most influential and impressions obtained and habits formed in the process of study are long-lasting. They are difficult to correct later when the techniques are applied in practice.

The authors of several texts also fail to distinguish between depreciation as used in valuation work, and depreciation as used in the accounting sense. The average text fails to emphasize that the latter is merely a convention theoretically designed to spread capital costs on some workable basis over an extended period of service. The incalculable and unpredictable factors in depreciation accounting and the consequent limitation of accuracy are not stressed and are frequently ignored. The reader obtains the impression that all is "cut and dried," that all one has to know is a little arithmetic to be an expert in depreciation accounting, and that depreciation accounting is solely the province of the accountant when, in fact, highly informed and comprehensive managerial judgment is a prerequisite. One should be made to realize that the problem is not within the exclusive province of any one art or science but requires background in engineering, economics, finance, law, philosophy, and accounting.

Other deficiencies in the average text include the failure to describe the difference between unit and group depreciation accounting, the meaning of mortality dispersion, methods available for use in study of mortality and other data to estimate service life, [illegible]ations of mortality experience in predict[illegible] life expectancy of surviving units, the relative importance and predictability of the various causes of mortality of industrial property. Certainly, the capital recovery factor is of sufficient importance in industrial accounting to warrant greater attention than is currently given in texts.

Frequently the cost accountant is called upon to render service in studies which involve the comparison of the relative economy of alternate methods, machines, processes, etc. For this reason, a text on cost accounting should include an introduction to the basic principles of engineering economics. This subject is usually ignored or given slight attention.

Text material and problems designed by the authors rarely describe the practical problems in industry relating to the allocation of such joint costs as general and administrative salaries and expenses, engineering and design costs, purchasing and stores, and similar costs, to the various phases of the business—product manufacture, marketing, plant construction, plant demolition, general and administrative, and financial. Cost accounting for product manufacture is, of course, the important phase and should receive the most attention, but the reader gains the impression that no problems exist in plant construction, demolition, maintenance, and other phases of the industrial enterprises. He should understand that coordination and integration of all the phases of the business in cost-keeping and allocation is a real problem.

The task of broadening the education of accounting school graduates, as well as practicing accountants, will be easier when such material is included in the basic accounting textbooks.

A. J. BRODTMANN, *New Orleans Chapter*

Notes on Current Reading

Books and Pamphlets

Cost Accounting — Text, Problems, and Cases

Clarence B. Nickerson, McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y., 1954, 462 pp., $7.00.

Aimed to "assist the student in development of his power to grapple with facts in the analysis of business problems . . . within the framework of cost accounting," this case book opens with introductory material and proceeds to a consideration of some sixty or seventy individual cases grouped into thirteen classifications. Three of these are variance analyses, budgetary control, and alternative choice. The others have like pertinence to the work of the industrial accountant.

An Introduction to Cost Accountancy, Volume II

R. Warwick Dobson, Gee and Company, Ltd., 27-28 Basinghall Street, London, E. C. 2, England, 1954, 250 pp., $4.00

This volume, of a series of three, is concerned largely with the process of cost accounting and the related methods and organization problems. It comprises Chapters XVI to XXIV of the entire work. Those which went before, in Volume I, dealt with classifications of costs and with cost centres, etc. Those which are to come, in Volume III are covered by that volume's title, which will be "Cost Recording and Presentation."

Profit and Loss Budgeting—A Case Study of Three Manufacturing Companies

W. D. Knight, University of Wisconsin, School of Commerce, Bureau of Business Research, Madison, Wisc., Paper Bound, 1954, 62 pp., $1.15.

There is perhaps novelty in this "cooperative case study" in which budgeting at Allis-Chalmers Manufacturing Company, Kimberly Clark Corporation, and Snap-On Tools Corporation is reviewed and the feature of the methods used are pointed up in a chapter entitled "Comparisons and Conclusions." The study was participated in by the budget directors of the three companies and a chapter of the National Society for Business Budgeting.

Proceedings of the First Annual Institute of Accounting

University of Colorado, Boulder, Colorado, 1954, 66 pp.

In the one-day (April 30, 1954) institute which this publication reports, were given and are here reproduced, five addresses. These dealt with "Internal Auditing in Present-Day Management," "Budgeting Problems," "The 'New Look' in Practical Budgeting," "Budgetary Problems encountered in Public Utility Regulations" and "The Controller's Place in Management."

Register of International Research in Accounting

Incorporated Accountants' Research Committee, Oxford University Press, London, E. C. 4, England, Paper Bound, 66 pp.

An alphabetical list of more than 100 subjects, on which current accounting research is being conducted, with sponsoring institutions, is given in the first section of this compilation, each is more particularly described in the second section (main body) of the work and, in the third section, the sponsoring institutions are alphabetically listed. These number some 35 associations and universities in England and the Dominions, on the continent, and in the United States. N.A.C.A. research is dealt with on pages 34-36.

SELECTED ARTICLES FROM ACCOUNTING PERIODICALS

ACCOUNTANT'S JOURNAL, June (304 Burke Building, Manila, Philippines, single copy $1.00)
- Auditing With Accent on the Income Statement. Eduardo C. Gopez
- Self-Audit for Accounting Instructors (reprint from American Accounting Association material)
- Inventory Valuation Methods in Accounting. M. B. Apacible

ACCOUNTING RESEARCH, July (Cambridge University Press, 32 East 57th Street, New York, N.Y.)
- Life and Standard Costs. Myron J. Gordon
- *The Profession of Accountancy in the United States. Nicholas A. H. Stacey

AUDITGRAM, September (The National Association of Bank Auditors and Comptrollers, 38 South Dearborn Street, Chicago 3, Ill.)
- *Cost Accounting Dividends. Robert J. Schumann

CANADIAN CHARTERED ACCOUNTANT, August (10 Adelaide St. E., Toronto, Ontario, Canada, single copy $.50)
- How Accountancy Influences Credit Policy in Industry and Business. George Moller

THE CONTROLLER, September (1 East 42nd Street, New York 17, N.Y., single copy $.50)
- The Planning and Control Concept. James L. Peirce
- Work Measurement Procedures. Ralph A. Martin
- Return on Investment. Thomas H. Casson

THE COST ACCOUNTANT, August (63 Portland Place, London W1, England)
- The Influence of the Size of a Business on Costing Techniques. J. L. Hilton

COST AND MANAGEMENT, July-August (66 King Street E., Hamilton, Ontario, Canada, single copy $.50)
- Reports for Management. G. W. McRoberts
- Accounting for Sales Compensation and Salesmen's Commissions. Harold E. Gannon, Jr.
- *Improving Cost Control in Non-Productive Departments. Donald E. Chapman

JOURNAL OF ACCOUNTANCY, August (270 Madison Avenue, New York 16, N.Y., single copy $.75)
- A Brief Introduction to the New Internal Revenue Code. J. S. Seidman
- Business Expenses and Deductions for Corporations and Individuals. Charles H. Whitehead
- Determining Basis, Gain or Loss; Capital Gains and Losses. Gerhard Meyer
- Accounting Procedures and Methods Under the New Revenue Code. Walter L. Schaffer
- Tax Effects of Corporate Distributions and Adjustments. T. T. Shane
- Deferred Compensation Plans: Employee Stock Options. Matthew F. Blake
- The Administrative Provisions for Returns and Payments. James F. Pitt

SELECTED ARTICLES FROM BUSINESS PERIODICALS

ADVANCED MANAGEMENT, August (74 Fifth Avenue, New York 11, N.Y., single copy $.75)
- *Cost Reduction Through Industrial Engineering. R. Conrad Cooper

NATION'S BUSINESS, August (1615 H Street, N. W., Washington 6, D.C., single copy $.50)
- Business Files Hold 1,200,000,000,000 Worthless Papers. Joseph P. Blank

CREDIT AND FINANCIAL MANAGEMENT, September (33 South Clark St., Chicago 3, Ill., single copy $.25)
- Cash Forecast and Collection Budget Put Credit Management on Its Toes. L. W. Stolte

*Further mentioned in accompanying notes on particular articles.

Chart for Profits

Ivan M. Foley, Chart Publishing Co., 1533 Lafitte Avenue, New Orleans, La., 1954, Paper Bound, 53 pp., $4.50.

Forty of the indicated number of pages of this pamphlet tabulate gross profit figures of graduated amounts and, under column headings each showing a gross profit percentage (and the corresponding cost mark-up percentage), related absolute sales and cost of sales figures. Preceding the tabulation are several pages of introduction describing the use of the table under various assumptions. The title page notes that the presentation was edited by Dr. Paul C. Taylor.

Handbook of Graphic Presentation

Calvin F. Schmid, Ronald Press Co., 15 E. 26th St., New York 10, N. Y., 1954, 316 pp., $6.00.

That portion of statistical methods which results in picturized representation of existing conditions or results of studies, has special appeal in practice, if only because it creates confidence in technical analyses which issue in understandable results. The present work is devoted to the sound construction of statistical edifices of this character and includes a large number of them of various types (e.g., bar charts, frequency graphs) for illustration.

Articles

Improving Cost Control in Non-Productive Departments

Donald E. Chapman, Cost and Management, July-August 1954.

The situation which was corrected in the company which serves as background for the present paper was analyzed, studied and interpreted by the systems and controls department (other companies and accounting and business literature were also studied). The result was a definite channeling of departmental effort in a manner conducive to control. The article exhibits the reporting media adopted.

Cost Reduction Through Industrial Engineering

R. Conrad Cooper, Advanced Management, August 1954.

If the industrial engineering side of cost reduction has receded from view in any particular case, this article should bring it to the fore (and any issues involved in this process). The author discerns eight areas of management. In the light of these, he reviews a number of situations which emphasize the possibilities of cost reduction, without needing to touch on the accounting function in connection with them.

Cost Accounting Dividends

Robert J. Schumann, Auditgram, September 1954.

This is a somewhat general but provocative article—not computing standards for work in a bank or indicating the formula for such computations—but surveying bank operations in a fairly extensive manner which suggests that a bank is little different from any other business institution in having costs to control (and customers to please). It is noted that production figures on which costs may be had, may not be a monthly "must" but that a bank would be better off with a working knowledge of them.

The Profession of Accountancy in the United States

Nicholas A. H. Stacey, Accounting Research, July 1954.

Although public accounting attracts the attention of the present author more than industrial accounting, the article does go further at many points and reports on accounting associations and the place of accounting in educational institutions. There are also comparisons between American and British conditions, informative to accountants on both sides of the Atlantic.

For Your Information

IN THE LAST DAYS of the recent session of the Congress, a quantity of much-publicized legislation at last took final form. The material on these pages of the *Bulletin* does not reflect study of this legislation but merely presents a note of several sources of information on the revised Internal Revenue Code which have made their appearance and reproduces a brief write-up authored by an N.A.C.A. member, describing and commenting on certain of the changes made in the re-enacting and extension of the Renegotiation Act of 1951.

Published Analyses of the Internal Revenue Code of 1954

Three items (forerunners of the many which will doubtless appear shortly and over the coming months) informative and reasonably succinct on the revised Internal Revenue Code, enacted August 16, 1954 are a pamphlet entitled, *A Concise Explanation of the Internal Revenue Code of 1954* which has been distributed by the National City Bank (the title page notes copyright by Prentice-Hall, Inc., 70 Fifth Avenue, New York, N. Y., 48pp), a publication entitled *New Revenue Code of 1954 Explained* (Commerce Clearing House, 214 North Michigan Avenue, Chicago 1, Ill., 192 pp $2), and the September 1954 issue of *The Journal of Accountancy* (270 Madison Avenue, New York 16, N. Y., 75¢) the contents of which is devoted almost wholly to the new code.

Also, the American Management Association (330 W. 42nd Street, New York 36, N. Y., members of A.M.A. $2.00, nonmembers $2.75) has published a 45 page *Corporate Tax Summary of the 1954 Internal Revenue Code* by William M. Kunstler, giving old and new provisions topically in comparative form.

Following the order of code sections in its comments, the *Concise Explanation of the Internal Revenue Codes* consists of one or more paragraphs under applicable sections pointing out how "substantive provisions of the 1954 code differ from the 1939 code."

New Revenue Code of 1954 Explained is divided into three parts to facilitate use. These are an introductory explanation of changes and new provisions, a "finder" relating old and new code sections, and a listing of effective dates cited throughout the law.

The articles on the revised code which appear in the September 1954 *The Journal of Accountancy* are on selected topics but are prefaced by introductory comment on the new law as a whole.

CHANGES IN RENEGOTIATION ACT

by C. RICHARD GUNZER
C.P.A., Stamford, Connecticut

CONGRESS HAS EXTENDED the Renegotiation Act of 1951 to December 31, 1954. This is a one-year extension, retroactive to January 1, 1954. The extension of the Renegotiation Act of 1951 to the end of 1954 is of significance to defense contractors. It means that Congress and the Administration are not convinced that the settling down of the defense-procurement program has eliminated the possibility of "excessive profits" from the manufacture of defense articles, notwithstanding tightened procurement procedures and stiffer competition for such business. A summary of the principal changes, with their effective dates, is as follows:

Act Section	*Subject*	*Effective Date*
105 (f)(1)	Renegotiable minimum increase from $250,000 of sales to $500,000.	Fiscal years ending on or after June 30, 1953.
106 (a)(6)	Certain synthetic rubber contracts exempted from renegotiation.	Retroactive to March 23, 1951 (original enactment date).
106 (a)(8)	Standard commercial articles placed in mandatory exemption class if contractor can qualify.	Applies to amounts received or accrued after December 31, 1953.
106 (c)(2)	Durable productive equipment exemption extended to prime contracts. Government acquisition clause eliminated.	Fiscal years ending on or after June 30, 1953.

Exemption of Sales Below $500,000

Through the raising the re-renegotiable sales minimum from $250,000 to $500,000 for fiscal years ending on or after June 30, 1953, many of the smaller contractors are freed, at least temporarily, from the impact of renegotiation. This will likely bring about stiffer competition for defense business by the smaller companies. It will also discourage many others from going after business which will push their defense-sales volume over the $500,000 minimum.

Exemption of Synthetic Rubber Contracts

The change concerning the exemption of designated types of contracts involving the manufacture and sale of synthetic rubber (effective retroactively to the enactment date of the Act—March 23, 1951) is not of great consequence, as the Board had already exempted the sales of synthetic rubber being used for nondefense purposes. The amendment provides that the Board's determination as to the accuracy of the contractor's method used in the segregation of sales between those for defense and those for nondefense purposes is final and not reviewable by the Tax Court or any other court or agency.

Exemption of Standard Commercial Articles

The change made by Congress in placing standard commercial articles in the mandatory exemption class is of great significance to many defense contractors. If a contractor can show to the satisfaction of the Board that his product meets the definition of a "standard commercial article" (Sec. 106 (a)(8) of the Act), these sales are not renegotiable, regardless of whether or not the product goes into defense channels. The Board must prescribe by regulations the manner by which the contractor is to make application for approval of his claim to this exemption. The Board has six months from the date the contractor files the application for exemption. If the Board fails to do either within six months, the application is, in effect, automatically approved. The grounds for denial of the exemption of all or any part of the product line applied for must be based upon a finding that competitive conditions affecting the sale of the articles are such as will not reasonably prevent excessive profits.

As to what are included in the exemption, the law states:

(B) [in part]

"The term 'standard commercial article' means an article—

(1) which, in the normal course of

business, is customarily maintained in stock by the manufacturer or any dealer, distributor, or other commercial agency for the marketing of such article; or

(2) which is manufactured and sold by more than two persons for general civilian industrial or commercial use, or which is identical in every respect with an article so manufactured and sold;

(C) the term 'identical in every respect' means of the same kind, manufactured of the same or substitute materials, and having the same industrial or commercial use or uses, without necessarily being of identical specifications;

(D) the term 'persons' does not include any person under the control of, or controlling, or under common control with any person considered for the purposes of subparagraph (B) (2) of this paragraph." (Sec. 106).

Undoubtedly the board will release regulations in the near future covering application for the "standard commercial article" exemption. In the meantime contractors and their advisors might well review the renegotiation files on settled or pending renegotiable years and see what has already been said about the product. Unfortunately, many of these files will reveal such statements as that the product is "very special," "only our company can make it," "there is a tremendous difference between our renegotiable product and our commercial line," "we have no competitors," etc., all previously designed to impress the renegotiator with the risk involved, the difficulties of manufacture, efficiency, etc. All of these statements might have been quite true. They do, however, present a problem in now arguing that the product is "identical in every material respect" with articles manufactured and sold by others.

However, since the exemption applies to amounts received or accrued after December 31, 1953, what went on before may or may not have a determining effect on the argument presented in applying for exemption. Every conceivable angle should be explored to determine to what degree the product can now meet the definition of "standard commercial article." This effort will come in handy when actual application is made for the exemption of all or part of the sales from renegotiation.

Exemption of Durable Productive Equipment

In addition, the relief provision affecting machine tool sales, the so-called partial mandatory exemption, has been extended to prime contracts with the government. Formerly a prime contractor selling to the government could not qualify for this at all. Neither could a subcontractor who was selling to a prime contractor or upper tier subcontractor, if the original contract gave the government immediate or ultimate title to the productive equipment involved.

This was known as the "government acquisition clause." It has now been eliminated as a barrier, with the result that both prime and subcontractors need only include in renegotiable sales that portion of durable productive equipment sales represented by the ratio which five bears to the useful life of the machinery, indicated by Bulletin F of the Bureau of Internal Revenue (1942 edition). Thus only 25 per cent of the sales of a machine having a useful life of twenty years need be included in renegotiable sales by either a prime or subcontractor. Long-life tools and other equipment are included in this exemption, too, unless the Board finds that they cannot be converted for commercial use.